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Report No. 13679

PROJECT COMPLETION REPORT

BANGLADESH

SHRIMP CULTURE PROJECT  
(CREDIT 1651-BD)

NOVEMBER 4, 1994

Agricultural Operations Division  
Country Department I  
South Asia Regional Office

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## **CURRENCY EQUIVALENTS**

Currency Unit = Bangladesh Taka (Tk)

At Staff Appraisal Report Year (1985)	US\$1 = Tk 35.4
At Completion Year (1993)	US\$1 = Tk 40.0

## **FISCAL YEAR**

July 16 - July 15

## **WEIGHTS AND MEASURES**

Metric System

## **ABBREVIATIONS**

ADP	Annual Development Program
BB	Bangladesh Bank
BWDB	Bangladesh Water Development Board
DCA	Development Credit Agreement
DFTC	Demonstration Farm and Training Center
DOF	Department of Fisheries
ERR	Economic Rate of Return
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GOB	Government of Bangladesh
IDA	International Development Association
MOFL	Ministry of Fisheries and Livestock
NGO	Non-Government Organization
OLFP	Oxbow Lakes Fisheries Project
O&M	Operation and Maintenance
PBs	Participating Banks
PCR	Project Completion Report
PL	Post Larvae
PIU	Project Implementation Unit
RMB	Resident Mission Bangladesh (World Bank)
SAR	Staff Appraisal Report
SDR	Special Drawing Rights
TA	Technical Assistance
UNDP	United Nations Development Program

**THE WORLD BANK**  
Washington, D.C. 20433  
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Office of Director-General  
Operations Evaluation

November 4, 1994

MEMORANDUM TO THE EXECUTIVE DIRECTORS AND THE PRESIDENT

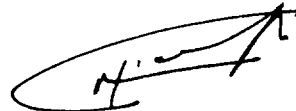
**SUBJECT: Project Completion Report on Bangladesh  
Shrimp Culture Project (Credit 1651-BD)**

Attached is the Project Completion Report on Bangladesh—Shrimp Culture Project (Credit 1651-BD) prepared by the South Asia Regional Office. Part II was prepared by the Borrower.

The project aimed to increase shrimp production in coastal polders through improved infrastructure and operations, thus increasing farmers' income and exports. The training and extension efforts by a state agency and a local NGO were successful in bringing new skills to staff and farmers' groups. As a result shrimp fishing areas, production, and export increased to levels close to SAR targets. However, serious problems (delays, construction flaws) occurred in the civil works and hatchery components, and the credit component was not used.

The institutional design left a great deal to be desired. Lack of provision for operations and maintenance (O&M) remained a major problem at the time of PCR preparation. Compliance with the cost recovery covenant did not begin until 1993, after a revised mechanism was agreed. Clear O&M roles for public agencies and farmers' groups were not in place at project closing. The PCR mission observed that the training and extension efforts were already undermined by lack of funding, and that the civil works were deteriorating. The outcome of the project is rated marginally satisfactory because shrimp production and export increases are close to targets. However, institutional development is rated as modest and sustainability as uncertain.

The PCR is satisfactory. It describes shortcomings in project design, implementation, and O&M and provides a plan for curtailing further deterioration of investments. An audit of this and other Bangladesh projects dependent on community involvement may be conducted at a later time.



Attachment

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# **PROJECT COMPLETION REPORT**

## **BANGLADESH**

### **SHRIMP CULTURE PROJECT**

(Credit 1651-BD)

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# **PROJECT COMPLETION REPORT**

## **BANGLADESH**

### **SHRIMP CULTURE PROJECT**

**(Credit No. 1651-BD)**

#### **PREFACE**

This is the Project Completion Report (PCR) for the Shrimp Culture Project in the People's Republic of Bangladesh for which Credit No. 1651-BD in the amount of SDR 20.6 million was approved on January 14, 1986. The total cost of the project amounted to US\$36.7 million for which IDA was to provide US\$22 million (converted at the SDR exchange rate of that time), UNDP US\$4.5 million, the Government of Bangladesh US\$4.5 million in local currency including taxes and duties, and the remainder of US\$5.7 million was to be provided by Bangladesh Bank, participating banks and investors. The Credit was signed on February 14, 1986, became effective after three extensions of the effectiveness date on October 30, 1986, and closed after four extensions for a total duration of 24 months on October 31, 1993. A total of SDR 13.5 million was disbursed and the undisbursed balance of SDR 7.1 million cancelled; the final disbursement was made on February 17, 1994.

The Evaluation Summary and Parts I and III of the PCR were prepared by an FAO/World Bank Cooperative Program mission which visited Bangladesh in October 1993, and revised by staff of the Bangladesh Resident Mission and the Agriculture Operations Division of the Country Department 1, South Asia Region. The PCR is based, inter alia, on a review of the Staff Appraisal Report (SAR), the Development Credit Agreement (DCA), supervision reports, project files, and on field visits to project sites, discussions with Borrower staff and beneficiaries, participating banks and with IDA staff associated with the project. UNDP's comments on the PCR have been taken into account. The Borrower submitted Part II in June 1994.





**PROJECT COMPLETION REPORT****BANGLADESH****SHRIMP CULTURE PROJECT**

(Credit No. 1651-BD)

**EVALUATION SUMMARY****Background (Section 2)**

(i) The fisheries subsector in Bangladesh is of considerable importance because of its contribution to nutrition, income, employment generation and foreign exchange earnings. The country has a diverse aquatic wealth and a climate suitable for high yields and a considerable increase in fish and shrimp production. IDA has been involved in the subsector since 1975 and the first major investment -- the Oxbow Lakes Fisheries Project (OLFP) Cr.890-BD -- was made in 1979 to develop the inland oxbow lakes. During the course of implementation of OLFP, the Government of Bangladesh (GOB) requested IDA assistance to develop the coastal lands for the production of brackish water shrimp, mainly to increase shrimp exports and farm incomes in coastal rural areas. A shrimp culture project was identified in May 1981. A project preparation report was available in May 1983, and this, together with a report on preliminary detailed design by a local consultant, served as the basis for appraisal in October/November 1984. The project was approved by IDA on January 14, 1986.

**Objectives, Components and Costs (Section 3)**

(ii) The project aimed at intensifying the production of brackish water shrimp (*Penaeus Monodon*) in the coastal areas, through the introduction of improved water management and related shrimp culture practices. The project aimed primarily at generating foreign exchange earnings and increasing incomes and economic activity in coastal rural areas.

(iii) The project was also expected to strengthen fisheries administration and extension services, initiate procedures on the basis of existing legislation for controlled salt water intake in polder areas for the purpose of shrimp culture, modify land lease policies, improve capacity utilization of the shrimp processing industry and improve marketing of shrimp. These objectives were to be achieved by the provision of infrastructure to permit efficient water management in about 7,000 ha of poldered area in Khulna and Cox's Bazar districts and the supply of high-quality shrimp seed; development of an additional 2,500 ha through improved extension services without public investment; supply of medium-term credit to shrimp farmers, traders, and hatchery operators for on-farm works, marketing equipment and the establishment of hatcheries; institutional support for the Project Implementation Unit (PIU) of the Department of Fisheries (DOF), and the Bangladesh Water Development Board (BWDB), and local and foreign training. To assist GOB in the implementation of the project and for farm and hatchery design work, the project provided technical assistance (TA). The project, phased over a five-year period, was

estimated to cost Taka 1,299 million (US\$36.7 million) and was to be financed through an IDA Credit of US\$22 million (SDR 20.6 million), a United Nations Development Program (UNDP) grant of US\$4.5 million for TA, and the rest by GOB, Bangladesh Bank (BB), Participating Banks (PBs) and various investors.

### **Implementation Experience (Section 5)**

(iv) The Credit did not become effective until eight months after signature mainly because of delays by GOB in meeting three of the six conditions of effectiveness: finalization of the UNDP Project Document, the Participation Agreements between BB and PBs, and the Banking Plan.

(v) The project faced problems in the initial years, but by the time of Credit closure, one and a half years behind schedule, most of the physical targets had been met (Part III Section 4). Initial delays were largely due to problems associated with land acquisition; delays in civil works procurement because of lengthy procedures and approvals; and late release of funds. Parallel to this were the delays in the construction of hatcheries because of site selection problems and the uncertainties on the size and viability of the hatcheries to be constructed. The construction of the PIU Demonstration Farm and Training Centers (DFTCs) was also delayed because of the site issue (para 5.12). In addition, the devastating cyclone of April 1991 caused damages to the civil works in the Cox's Bazar area. Problems during implementation also emerged as a result of the original weakness in project design, which concerned the approach to maintenance of facilities, and of the short implementation period (paras 4.2 and 4.3)

(vi) The construction works in the polders, planned to be completed in two years, extended in most cases up to four years, with some works still remaining incomplete in three out of the six polders (Part III/Section 4B). With the exception of sub-standard compaction of earthfill in embankments construction, the overall quality of civil works is satisfactory. In the case of PIU, all planned civil works, except for the Khulna office and residential buildings, were completed. The Khulna buildings could not be constructed because of delays in finalizing civil works procurement (para 5.11). The progress on the construction of the project-financed, PIU-managed hatcheries was also slow mainly due to site-related problems. The quality of the construction work of the hatcheries is poor as evidenced by a number of design and engineering flaws which need to be rectified in order to put the hatcheries into effective use (para 5.9). Because of the delays in the construction of the hatcheries, two makeshift mini-hatcheries were constructed to demonstrate the production technology and train PIU technical staff and private sector operators (para 5.8). The credit component performed poorly because of the institutional weaknesses in the country's credit system (para 5.10). The performance of the international consulting firm, appointed by IDA under the UNDP grant, was mixed. The firm provided satisfactory support to PIU in designing and implementing the extension program, establishing and operating the makeshift hatcheries and providing technical advice on BWDB's infrastructure works. However, the firm's support to the design and supervision of hatcheries was not satisfactory.

(vii) The final project cost is estimated to be about 75% of the appraisal estimate. Infrastructure was the largest component representing 63% of total project costs, and exceeding the appraisal estimate by 19%. Institutional support to PIU and BWDB exceeded appraisal

estimates by 11%, however, the credit component at 5% of the appraisal estimate was scarcely utilized. Of the original IDA Credit of SDR 20.6 million (US\$22 million), SDR 13.5 million was disbursed and the remaining SDR 7.1 million was cancelled in October 1993.

### **Project Results (Section 6)**

(viii) Overall, the project was largely successful in achieving the objectives envisaged at appraisal. The area under shrimp production (including additional area) is 96% of the appraisal estimate and the average production per hectare has almost quadrupled as compared with pre-project estimates (Annex 1, Table 1). The results of the two PIU-managed hatcheries constructed under the project have not been satisfactory, and the attainment of the planned seven million post-larvae per year from each hatchery seems unlikely (para 5.9). However, the mini-hatcheries proved to be a success. Monodon Larvae were produced in a hatchery for the first time in Bangladesh. The training covered under the project was diverse and the participants found it very useful in upgrading their technical and administrative know-how. A major impact was made under the project by the impressive work of the extension staff and the Non-Government Organizations (NGOs), enabling the formation of farmer groups and carrying out various welfare and income-generating activities. Farmers feel that the extension services provided under the project helped them considerably in increasing shrimp production. The project extension and training activities also helped the transfer of technology to areas outside the project. The project participants were able to enjoy increased net incomes, and the project had an impressive economic impact. Increased production helped in boosting the quantity of exportable shrimps thus enhancing the country's foreign exchange earnings. In addition, it had a significant impact on employment. It is estimated that the project will attain an economic rate of return of slightly over 20% compared with 27% estimated at appraisal (Annex 1, Table 8). Compliance with covenants, except that relating to cost recovery, was satisfactory (para 5.15).

### **Project Sustainability (Section 7)**

(ix) The present outlook for project sustainability is uncertain. Shrimp production can be sustained at present levels, or even increased, if the public infrastructure (especially embankments, regulators and canals) built under the project is properly maintained. The likelihood of this being done through the BWDB is scant, and no funds have been made available for this purpose through collection of water charges or budgetary allocations. However, because of the strong financial viability of shrimp farming, the beneficiaries may take on responsibility for necessary maintenance work if shrimp production levels start to drop as a result of inadequate BWDB infrastructure maintenance. Government support is also necessary to maintain the extension services. To ensure the sustainability of the demonstration farms and training centers, these should be transferred immediately from the development budget, which was exhausted after Credit closure, to the GOB revenue budget. As far as the hatcheries are concerned, the design and engineering flaws identified should be rectified and the two hatcheries operated on sound commercial practices. GOB's intention to sell or lease the hatcheries to the private sector should be supported.

**Findings and Lessons Learned (Sections 9 and 10)**

(x) The project's success in achieving its objectives can be attributed to the project's simple design which involved proven shrimp culture technology and a good extension and training effort. The performance of the Borrower in carrying out its obligations was generally less than adequate. A major problem was the delayed compliance with the cost recovery covenant (compliance was achieved in February 1993 in contrast with December 31, 1987 as stipulated in the Development Credit Agreement). Despite persistent reminders by IDA, there was virtually no progress in achieving compliance until 1991 when IDA made Credit extensions conditional on GOB achieving compliance with the covenant. The main lessons learnt are: details of Operation and Maintenance (O&M) should be clearly addressed and agreed with all participants at appraisal; a longer implementation period would have been more appropriate since land tenure conflicts and long procedures for approval of contracts are common in Bangladesh; projects which require group formation and social support programs benefit by involving NGOs; appropriate specialist expertise (hatchery design specialist) should be included during IDA supervision missions; selection of sites and preparation of detailed designs for the hatcheries and the DFTECs should have been finalized at appraisal; and a well-planned extension and training program could facilitate achievement of project objectives.

# **PROJECT COMPLETION REPORT**

## **BANGLADESH**

### **SHRIMP CULTURE PROJECT**

(Credit No. 1651-BD)

#### **PART I: PROJECT REVIEW FROM IDA'S PERSPECTIVE**

##### **1. Project Identity**

Project Name : Shrimp Culture Project  
Credit No. : 1651-BD  
RVP Unit : South Asia Region  
Country : Bangladesh  
Sector : Agriculture  
Subsector : Fisheries

##### **2. Background**

2.1 Bangladesh is one of the poorest countries in the world with a high density of population and an annual population growth rate exceeding 2% over the last two decades. About 80% of the population live in rural areas, 75% depend directly on agriculture for their livelihood and nearly half of the rural households are landless. The development strategy of the Government of Bangladesh (GOB) has therefore emphasized measures to control population growth, increase food production and improve nutrition, alleviate poverty and generate employment through human resources development and contain the external trade deficit through exports.

2.2 Bangladesh's agricultural sector, including fisheries, contributes about 36% of Gross Domestic Product (GDP). The fisheries subsector contributes about 4% to Bangladesh's GDP and 10% to agricultural GDP. Despite its relatively small contribution to the national and agricultural GDP, the fisheries subsector is of considerable importance to Bangladesh's economy because of its contribution to the national objectives of improving nutrition, income, employment and foreign exchange earnings. The Land and Water Resources Study, completed by IDA in 1972, provided, inter alia, tentative proposals for accelerating development of the inland fisheries subsector. The 1983 IDA review of the fisheries subsector reemphasized the development of inland fisheries and recommended development of culture-based fisheries in

larger inland water bodies, shrimp culture in coastal areas and carp culture in ponds. This development strategy was confirmed in the "Draft Master Plan for Inland and Marine Fisheries Development and Management," prepared by Food and Agriculture Organization of the United States (FAO), which was later made public in March 1985.

2.3 IDA's involvement in support of Bangladesh's fisheries development began with the financing of an aquaculture component under the Karnafuli Irrigation Project (Cr.605-BD), followed by the signing of a Credit (Cr.890-BD) for the Oxbow Lakes Fisheries Project (OLFP) in April 1979. The OLFP introduced culture-based fisheries to oxbow lakes and had positive implications for inland fisheries development throughout the country. During the course of supervision of OLFP, IDA assisted GOB to identify a coastal aquaculture project with emphasis on shrimp culture. The Shrimp Culture Project preparation report of 1983, and the detailed engineering designs prepared by local consultants financed by UNDP in early 1984, formed the basis for IDA's appraisal in October/November 1984. Subsequently, towards mid-1990, IDA approved a Credit (Cr.2146-BD) for the ongoing Third Fisheries Project to support stocking of flood plains, coastal (shrimp) aquaculture for export and introduction of culture-based fisheries in private ponds (Part III/Section 1).

### 3. Project Objectives and Description

3.1 **Project Objectives.** The project aimed at intensifying the production of brackish water shrimp (mostly *Penaeus Monodon*) in the coastal area of Bangladesh through introduction of improved shrimp culture technology consisting of improved water management and related shrimp culture practices. Through increasing shrimp production, the project aimed at increasing foreign exchange earnings through export of shrimp and improving incomes, economic activity and nutrition in coastal areas. The project was also expected to strengthen fisheries administration and extension services, initiate procedures on the basis of existing legislation for controlled salt water intake in poldered areas for the purpose of shrimp culture, modify public land lease policies, improve capacity utilization of the shrimp processing industry and improve marketing of shrimp.

3.2 **Project Description.** To achieve the above objectives, the project provided for:

#### **Infrastructure Development**

- (a) Construction of embankments and water control structures which would permit more efficient water management in about 7,000 ha of poldered areas in Khulna and Cox's Bazar districts.
- (b) Development of 2,500 ha of additional areas for shrimp culture, in the same two districts, through extension services, training and credit without public investments.
- (c) Construction of two shrimp hatcheries to supply high-quality shrimp seed, one each in Khulna and Cox's Bazar districts.

### **Credit**

- (d) Supply of medium-term credit to shrimp farmers, traders and hatchery operators for financing on-farm investments, marketing equipment and private hatchery investments.

### **Institutional Support**

- (e) Financing of buildings, equipment, incremental staff salaries and incremental operating costs for the Department of Fisheries (DOF) and the Bangladesh Water Development Board (BWDB), in order to strengthen their ability to implement and monitor the project.
- (f) Construction of two Demonstration Farms and Training Centers (DFTCs), one each in Khulna and Cox's Bazar districts, to demonstrate improved shrimp farming techniques to fish farmers and extension staff.

### **Technical Assistance (TA)**

- (g) Consulting services to assist the DOF Project Implementation Unit (PIU) in shrimp farming techniques, including engineering works and hatchery designs, project management and coordination; training of shrimp farmers and extension officers; and providing fellowships for Subject Matter Specialists and PIU staff.

3.3 The project, phased over a five-year period, was estimated to cost Taka 1,299 million (US\$36.7 million) with land acquisition, civil works, equipment and vehicles accounting for 44% of the total cost and credit for on-farm works, private hatcheries and marketing equipment another 34%, the balance of the cost being for TA, incremental staff salaries, and O&M costs. The project cost of US\$36.7 million was to be financed by an IDA Credit of US\$22 million (SDR 20.6 million), a UNDP grant of US\$4.5 million for TA, a GOB contribution of US\$4.5 million, credit from Bangladesh Bank (BB) and Participating Banks (PBs) of US\$3.8 million, and contributions by various investors totalling US\$1.9 million.

## **4. Project Design and Organization**

4.1 **Project Design.** The project concept and design were generally appropriate and timely. The project followed two previous IDA Credits to the subsector (para 2.3); its strategy was in conformity with the 1983 IDA subsector review and the FAO Master Plan for the subsector (para 2.2); and it was formulated after a series of discussions, initiated as far back as 1979, between GOB and IDA regarding the development of coastal aquaculture. The areas selected for shrimp culture development were appropriate and suitable for extensive shrimp culture, without adverse effects on existing land use patterns. The proposed shrimp culture technology was simple and could easily be understood by all the parties involved in the project. Shrimp culture was to be carried out in rotation with paddy cultivation (Khulna District) or in rotation with salt (Cox's Bazar District) or with shrimp monoculture (Rampur Polder in Cox's Bazar District).

4.2 However, the project design did not detail the approach to Operation and Maintenance (O&M) of the completed civil works. The responsibilities of the implementing agencies and farmers in O&M of facilities were briefly outlined at appraisal. Also, detailed activities by the respective agencies and the farmers, including the type of maintenance required, frequency and costs, were not spelled out or explained to the implementing agencies and the ultimate beneficiaries. Omission to do so resulted in (a) utilization of the O&M funds for other purposes, and (b) delay in drawing up an effective O&M plan and mechanisms to implement the plan during the operational phases.

4.3 Another design weakness concerned the project implementation period. Given the bureaucratic delays in land acquisition and award of contracts, which are common problems in Bangladesh, the planned five-year project implementation period was optimistic. (para 8.1).

4.4 **Project Organization.** The project was implemented by PIU of DOF, BWDB, BB and PBs, belonging to three ministries (Ministries of Fisheries and Livestock; Irrigation, Water Development and Flood Control; and Finance), with the overall responsibility of project coordination given to PIU and the Ministry of Fisheries and Livestock (MOFL). BWDB had the responsibility to implement the water supply and drainage component of the project. Two banks - Bangladesh Krishi Bank and Sonali Bank - were selected as PBs to channel the project credit. Participation Agreements were signed between them and the Bangladesh Bank (BB), setting out the terms and conditions for their participation. In 1989, in order to improve credit coverage, a third PB, the Agrani Bank, was added.

## 5. Project Implementation

5.1 **Credit Effectiveness.** The Credit was approved by IDA's Board on January 14, 1986, signed on February 14, 1986 and became effective on October 30, 1986, after three extensions mainly to enable GOB to finalize (a) the UNDP Project Document for providing TA, (b) the Participation Agreements between BB and PBs, and (c) the Banking Plan.

5.2 **Implementation Schedule.** The project was scheduled to be completed by June 30, 1991 and the Credit was to have been closed by December 31, 1991. However, the Credit closure was extended by one and a half years to June 30, 1993 to facilitate completion of the remaining physical targets of the project.

5.3 **BWDB Infrastructure Works.** The performance under the infrastructure component was not satisfactory. The construction works in the polders, planned to be completed in two years, extended in most cases up to four years, with some works still remaining incomplete in three out of the six polders (Part III/Section 4B). The contributory factors were delays in civil works procurement because of lengthy procedures and approvals; late release of funds which affected specifically land acquisition and contractors' performance; changes to detailed engineering designs to accommodate revised farm sizes in one polder (Rampur); lack of coordination between implementing agencies at the initial stages of project implementation; limited period, about one month, available for construction of internal embankments and the canal system in salt/shrimp areas; and damage caused by the April 1991 devastating cyclone. All these problems were mainly responsible for extension of the original Credit closing date by 18 months to June 30, 1993 (para 5.2).



5.4 The quality of civil works was generally satisfactory. Concrete works were of an acceptable standard, the regulators were well constructed, and the main embankments were constructed to the required design profile. However, there are a number of defects that need urgent rectification, including unsatisfactory compaction of earthfill, excessive slopes in some reaches of embankments, and incorrect seating of control gates at some regulators.

5.5 The project had a provision for O&M during construction, with funds to be used for operations and preventive and periodic maintenance of civil works as and when the maintenance commitments of contractors were fulfilled. However, the bulk of these funds were exhausted by the third year of the project period on works unrelated to O&M, such as providing shrimp farms with temporary wooden intakes at Rampur because the infrastructure works were delayed. At Credit closure, infrastructure works showed signs of deterioration (para 5.4) with the only reported maintenance being repair work on gates. Operational activities during the project period were limited to gate regulation, which was carried out by a member of the O&M Sub-Committee<sup>1</sup>.

5.6 At Credit closure, no firm O&M plan for BWDB works, with costs and responsibilities for implementation during the operational phase of the project, had been prepared and no provision was allowed for this work under the revenue budget of the Annual Development Program (ADP) for 1993/94. Given that the water levy is to be based on full recovery of O&M costs incurred by the Government, a careful assessment of the maintenance work that could be carried out by farmers should be made. The PCR mission had discussions with BWDB field staff on an approach to be adopted. Guidelines discussed with BWDB field staff are given in Annex 2. If funds are not made available to carry out regular maintenance, the essential infrastructure is likely to deteriorate to such an extent that a rehabilitation program will be needed in a number of years to make the facilities operable again.

5.7 **Additional Area Development.** As against the appraisal target of 2,500 ha, an additional 2,965 ha (1,875 ha in Cox's Bazar and 1,090 ha in Khulna) has been developed under the project, mainly through extension support and the promotion of technological improvement due to demonstration farms. The services rendered have assisted farmers to increase yields by about 75%.

5.8 **PIU Shrimp Hatcheries.** The construction of two PIU-managed shrimp hatcheries, each with an annual production capacity of about ten million post larvae (PL), was financed under the project. However, these faced considerable problems during pre-construction and operational stages, with construction commencing about three years later than the appraisal estimate (Part III/Section 4B). The delay was mainly due to the unsuitability of sites and uncertainties about the size and viability of hatcheries. The technical suitability of the first Cox's Bazar site, selected by PIU, was subsequently in doubt, while a second site was considered unsuitable on a long-term basis because of the unstable beach which could create

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<sup>1</sup> The overall control of polder operations is by the O&M Committee. To facilitate operations at the grass roots level, PIU and the shrimp farmers agreed to form O&M Sub-Committees at each regulator. The Committees were also to assist BWDB in the collection of direct recovery charges from participating farmers.

costly problems of water intake. In the Khulna district, the salinity levels were unsuitable for the production of Monodon Larvae, the main species to be grown under the project. These problems led to a decision by MOFL/PIU to construct two makeshift mini-hatcheries to test and demonstrate the production technology, identify operational problems and initiate training of PIU technical staff and private sector operators.

5.9 The mini-hatcheries proved to be a success, with Monodon Larvae produced in a hatchery for the first time in Bangladesh. Encouraged by the success of the mini-hatcheries, MOFL/PIU decided to proceed with the construction of the two project hatcheries. Two suitable sites were eventually identified and the construction of the hatcheries started in March 1990, under the supervision of the project-appointed technical consultants who also designed them. The Cox's Bazar hatchery was completed in September 1991 and the Khulna hatchery in March 1992. Although the capacity of each hatchery was designed to produce ten million PL per annum, the hatcheries were planned to operate at 70% (i.e., seven million PL) of their capacity from Year four onwards, to take into account the progressive experience to be gained by the operators and gradual improvement in broodstock collection. Additionally, the estimated cost of the hatcheries was about 50% lower than the appraisal estimate. Despite the experience gained in constructing and operating the mini-hatcheries, the quality of the construction work of the main hatcheries was substandard as evidenced by a number of design and engineering flaws which resulted in leaks in some of the water tanks, cracks in the outdoor concrete larval rearing tanks, poor drainage from rearing tanks, insufficient indoor light for optimum larvae production, electrical, heating and aeration problems. In fact, the Hatchery Specialist, hired during the extended period of TA, found it necessary to revise the design of the main hatchery building facilities considerably in order to put the hatcheries into effective use. Because of disputes with the main TA consultants and the lack of funds, some repair works have still not been initiated (Para 12.1).

5.10 **Credit.** The performance of the credit component was poor. Disbursement of on-farm investment and hatchery loans was minimal<sup>2</sup>. None of the funds provided for marketing loans were disbursed. Overall, about 5% of the funds originally allocated for credit operations under the project were disbursed (Part III/Section 5). Disbursement was poor because of the delayed start of the water development infrastructure essential for on-farm investment, the inability of many would-be Borrowers to provide collateral required by the PBs and the bureaucratic and cumbersome loan processing procedures. Additionally, many of the would-be Borrowers were either defaulters under previous loans or did not have correct and up-to-date title documents to the land. These credit issues were inherent in the agricultural credit system and also prevailed at appraisal. However, because of the limited scope of the credit component and its focus on a few small geographical areas, the project was not used as a vehicle to remedy the problems of the agricultural credit system in the country. These weaknesses were to have been addressed in an IDA-assisted proposed Second Agricultural Credit Project, which, however, was not eventually processed by IDA because of the government's decision to write-off agricultural loans

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<sup>2</sup> In the case of hatchery loans, two out of the planned nine loans were disbursed. However, three other hatcheries were constructed by entrepreneurs using non-project funds but all received technical support from the project.

up to Tk 5,000 in 1991. The Shrimp Culture Project was to have disbursed subloans under a supervised credit scheme. However, without addressing the credit issues, a supervised credit scheme on its own was not sufficient to achieve the project's credit objectives. Since shrimp production has increased over the years, poor disbursement of the credit component has not generally hampered developments envisaged under the project. The farmers had access to credit from informal sources, such as processing plants and well-to-do individuals. The terms and conditions suited the Borrowers and the repayment was usually in kind (produce).

**5.11 Institutional Support.** With the exception of the PIU office at Khulna and residential buildings, the implementation of other items of institutional support (DOF's other offices and buildings, equipment and vehicles, incremental staffing, etc.) generally proceeded as planned. The Khulna buildings could not be constructed because of delays in finalizing the civil works construction arrangements. The buildings are now to be constructed with civil works funds under the IDA-assisted Third Fisheries Project, the Asian Development Bank-assisted Second Aquaculture Project, and GOB's own resources.

**5.12** Two DFTCs, one each at Khulna and Cox's Bazar, have been established, as planned, for the purpose of training fisheries officers and operators of shrimp farms, and to demonstrate improved techniques in shrimp farming to the public. However, as in the case of hatcheries, the construction work was delayed because of the difficulties encountered in the selection of appropriate sites to accommodate all the facilities. Construction work took 18-24 months more than envisaged at appraisal, delaying the commissioning and startup of full DFTC activities to 1992 in Khulna and to 1993 in Cox's Bazar. However, pending completion of the facilities, the DFTC activities were conducted in PIU offices and in demonstration farms of shrimp farmers in the polders. The demonstration farms, as completed, include nine nursery ponds and nine grow-out ponds in a total culture area of around 10.6 ha. These facilities have been built to acceptable designs and standards but their operations have been hindered or virtually stopped after Credit closure because of lack of operating funds.

**5.13 Training.** Under the project, extensive training of PIU and NGO staff, shrimp farmers and private sector hatchery and nursery operators was carried out. In Cox's Bazar, 546 courses were conducted by the Extension Unit, 17 courses by the Hatchery Unit and 96 courses by the DFTC Unit. In Khulna, the comparative figures were 991, 20 and 60 respectively (Part III/Section 4A). The areas of training imparted were diverse, including shrimp farm site selection, shrimp culture and hatchery management, nursery pond operations, shrimp harvesting and marketing, fry collection, water management, predator control, post-harvest technology, use of feed and feed preparation, credit, and land use regulations and taxes. The participants in the training found it very useful, and the training formed a key element in the extension efforts of the project which resulted in boosting private sector interest in brackish water shrimp production. However, the training activities have come to a standstill after Credit closure for want of operating funds. Between 1987 and 1992, 22 overseas study tours and 49 training courses were offered to the staff of MOFL/PIU, PBs and shrimp farmers. These overseas programs had mixed success, as some of the GOB staff who benefitted by such programs were not able to continue to use their skills in the project due to subsequent transfer from the project.

**5.14 Project-Related Technical Assistance.** The technical assistance component consisted of assistance to PIU in the fields of shrimp farming, hatchery and farm designs, construction

supervision, engineering/hydrology, project management, training, social and rural development aspects. This component was financed as a grant by UNDP and executed by IDA. An international consulting firm, in association with an NGO, provided the technical, management, supervision and social support to PIU. A total of 120 man-months of technical expertise were utilized, consisting of a team leader, a training and extension specialist, a hatchery expert, an aquaculture engineer/aquaculturist and around ten short-term experts. The first phase of this assistance ended on December 31, 1991, and the services of the consulting firm were not extended as only a limited number of consultants, were needed in the next phase. In line with the proposed extension of the overall project, UNDP extended the technical assistance project to June 30, 1993 and, during this extended phase, IDA, in consultation with the PIU, recruited a Hatchery Specialist, a local consulting firm to prepare an environmental impact study and the UNDP Terminal Report, and the NGO which participated in the first phase. In addition, funds were provided to PIU for local training based on an agreed training plan. This technical assistance arrangement proved successful. In addition to the above technical assistance, local consultancy services were procured for detailed engineering designs of civil works for the polders in Cox's Bazar (performance of the consulting services is described in para 12.1).

**5.15 Cost Recovery.** The Development Credit Agreement (DCA) required GOB to take all necessary measures, including the passage of a legislation by December 31, 1987, to set recovery charges which would enable full recovery of investment and O&M costs of the embankments and regulators constructed or rehabilitated under the project. The recovery was to commence from July 1, 1988, and was to be achieved through a direct levy on beneficiaries and an export cess on shrimp, applicable to non-project producers as well as to beneficiaries. The direct levy was to cover full O&M and 9% of investments costs, and the export cess was to recover the remaining investments costs. This original covenant was not fulfilled. More importantly, IDA eventually agreed that the original cost recovery proposals were inappropriate. In late 1991, the Cabinet decided that it would not be appropriate to impose an export cess and recommended that cost recovery be limited to 100% recovery of O&M costs through a direct levy by BWDB. In essence, the same provisions for cost recovery by BWDB would apply whether farmers produce shrimp or rice. IDA agreed to the proposed modification of the covenant. In principle, it was considered inappropriate to ask all shrimp producers, the majority of whom are not project beneficiaries, to pay for project construction costs. Moreover, the export cess was considered to be contrary to IDA's general desires to promote taxation policies which reduce anti-export bias and encourage export growth. The decision trend in world market price of shrimp (which had declined by about 35% from the value assumed in the 1985 SAR) added to the arguments for modification. Once modification in the covenant was agreed in principle, IDA made extension of the Closing Date conditional upon progress on this issue. To maintain pressure on this issue four Closing Date extensions were used for a total extension period of 18 months, as the cost recovery legislation was submitted to Parliament, was approved, and appropriate implementing rules were drafted and made effective (in February 1993). The actual cost recovery by BWDB has yet to start, since only preliminary arrangements, such as appointing staff for assessment are in place. The recovery issue is being pursued by IDA under the Third Fisheries Project. For this recovery purpose, some guidelines are given in Annex 2 of this report.

**5.16 Project Costs and Financing.** At completion, total project costs were estimated to be slightly over US\$27.0 million or about 75% of the appraisal estimate (Part III/Section 5A).

Infrastructure was by far the largest component, costing almost US\$17.0 million or 63% of total project costs and exceeding the appraisal estimate by 19%. Infrastructure costs include about US\$1.0 million of expenditure incurred but not yet paid to the contractors and therefore not reimbursed by IDA. Institutional support to DOF and BWDB was the next major item of expenditure, costing almost US\$7.0 million and exceeding the appraisal estimate by almost 11%. As already noted (para 5.10), the credit component was largely unused, accounting for only US\$0.56 million as compared to the SAR estimate of US\$12.2 million. IDA financed almost US\$18.0 million (equivalent to SDR 13.5 million) of the project costs (Part III/Section 5B). This represents about 65% of the IDA Credit and the remaining 35%, or SDR 7.1 million, was eventually cancelled (Part III Section 3).

## 6. Project Results

6.1 **General.** Albeit with a delay of about two years, the project has been largely successful in achieving its objectives.

6.2 **Shrimp Production.** The total area brought under shrimp production was 9,145 ha, or 96% of the appraisal estimate. Of this, 6,180 ha, or 88% of the appraisal estimate of 7,000 ha, is the main project area developed with public investment, while 2,965 ha, or 118% of the appraisal estimate of 2,500 ha, is the additional area developed without public investment. Average production per ha has almost quadrupled to 262 kg/ha compared to 65 kg/ha in 1987. As shown in Annex 1/Table 1, there have been more output increases in Khulna where average production per ha has increased five-fold from 68 kg to over 344 kg. Although some individual farms obtained peaks ranging between 410-470 kg/ha, production in other farms has still been far below the average because of high mortality in both nurseries and grow-out ponds, low stocking density and irregular water exchange. Average production at full development in the main project area is expected to rise to 400 kg/ha for shrimp monoculture and to 350 kg/ha for shrimp/paddy or shrimp/salt rotation. The SAR and PCR estimates of incremental production are given in Part III/Section 6A.

6.3 **Hatchery Production.** The performance of the PIU hatchery component was mixed. The hatcheries were generally successful in demonstrating the production technology through training of PIU staff and private sector operators. In fact, the hatchery training courses inspired entrepreneurs to establish their own nurseries and hatcheries (paras 5.8 and 5.9). The production results of the hatcheries, however, were not satisfactory for a number of reasons such as design and engineering deficiencies, which need to be rectified, availability of broodstock, lack of adequate and timely operating funds, partial damages caused by the April 1991 cyclone and mortality of fry caused by unhygienic operating practices. The highest production of PL in Cox's Bazar was 0.60 million in 1992 and in Khulna it was 0.32 million in 1993, in contrast with 1.61 million and 4.0 million respectively estimated in the financial and economic models of the hatcheries prepared by PIU with the assistance of the project consultants. However, even in normal conditions, it is doubtful whether the hatcheries will be able to attain the 7.0 million PL production target (para 5.9).

6.4 **Transfer of Technology.** On-farm extension activities proceeded satisfactorily and should be commended. This is reflected in the increased trend in shrimp production activities in all the polders and increased additional area which benefitted from the project. The impact

of extension activities, demonstration farms, and training programs (carried out during the project period) on the shrimp culture farming methods was not limited to the project area. As a result of the project, an extensive farming system has spread throughout the coastal belt. Farmer-extension staff relationships have been well established and a large number of farmers have been trained in nursery and on-farm management. The ability to maintain this essential level of service is being undermined by the fact that extension staff have not received their salaries since the project was completed. A similar situation is noted in the demonstration farms and training centers. In addition, the social development activities carried out by the participating NGO were successful in forming farmers' groups, carrying out of various welfare programs, savings mobilization, and getting families, including women, involved in other income-generating activities.

**6.5 Financial and Economic Results.** Through increased production levels, the project participants enjoy increased net incomes. As shown in Annex 1/Table 4, net farm incomes per ha with the project are Tk 36,000 for shrimp and paddy rotation, Tk 45,000 for shrimp and salt rotation, and Tk 53,000 for shrimp monoculture. These net incomes are lower than the appraisal estimates in 1993 constant prices because of comparatively higher input costs and lower output prices, particularly for paddy.

**6.6** The economic impact of the project is highly satisfactory. Not only has there been an increase in personal incomes and, therefore, in economic conditions of shrimp farmers, but also there has been a boost to the quantity of exportable<sup>3</sup> shrimp and fish, thereby enhancing the country's foreign exchange earnings. The project also has had a significant impact on employment. Over 4,000 farm families benefitted from employing almost 30,000 people (see Part III/Section 6A). There was also employment created in the construction industry as a result of the infrastructural activities of the project. The number of such jobs cannot be quantified. Other unquantifiable economic benefits included improved nutrition for the local population because of increased availability of shrimp and fish products and a better environmental ambience for the shrimp farming communities because of improved infrastructure for the polders.

**6.7** The re-estimated economic rate of return (ERR) is slightly over 20% (Part III/Section 6C and Annex 1/Table 8). This is seven percent below the appraisal estimate of 27% mainly because of the delayed completion of infrastructure which meant that most project benefits have lagged by 2 or 3 years compared to the appraisal estimate.

**6.8 Environmental Impact.** There are no negative environmental effects caused by the project. The land use pattern and the ecological balance have not changed as a result of project interventions. On the contrary, some of the adverse effects which existed under pre-project conditions, such as water logging and illegal and uncontrolled cuts in embankments for the installation of sub-standard inlet structures, have been minimized or eliminated by project interventions. No mangrove forests have been destroyed as a result of the project. The findings

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<sup>3</sup> Shrimp exports increased from 16,200 tons in 1987 to 19,200 tons in 1993: it is estimated that at least 40% of the incremental exports (or 1,200 tons) due to the project.

of the study to assess the impact of shrimp culture on the environment, carried out under the project by local consultants, endorse this assessment.

## **7. Project Sustainability**

7.1 The present outlook for project sustainability is uncertain. Shrimp production can be sustained at current levels--and may even be increased--provided the water management infrastructure built by the project is properly maintained. Currently, the prospects of this being done by BWDB are not good. No funds have been allocated for BWDB to undertake maintenance activities nor are mechanisms in place for collection of water charges. However, given the demonstrated strong viability of shrimp farming, the beneficiaries themselves may take on necessary maintenance work once shrimp production levels begin to be affected by failing infrastructure.

7.2 Government support is also necessary to maintain the extension services. To ensure the sustainability of the DFTCs, these should be transferred immediately from the development budget, provisions for which were exhausted after Credit Closing, to the GOB revenue budget.

7.3 As far as the project provided hatcheries are concerned, these cannot continue to be run by civil servants under government procedures. It is, however, the intention of GOB to sell or lease out these facilities to the private sector which would be a correct step. To that end, however, the design and engineering flaws identified by the IDA supervision missions and the Hatchery Specialist during the extended technical assistance phase should be rectified, and the two hatcheries operated at least for a short period on sound commercial practices. Sufficient funding should be made available for O&M of the facilities and for conducting planned training activities. Import demand and prices for shrimp on the international markets remain steady, with a slight increase in prices in 1993. It is foreseen that the future market would get more active with an increase in price for most of the shrimp species. Export of project output should not face any demand constraints, provided hygienic standards and international specifications are maintained.

## **8. IDA Performance**

8.1 IDA assistance under the project has resulted in providing a strong base to support and accelerate the development of shrimp culture in the country. Although IDA performance was generally good throughout the project cycle, there were some weaknesses. Given the bureaucratic delays in land acquisition and awards of contracts, which were common problems in the country, a less optimistic approach should have been taken in fixing the completion date of the Credit. Site selections and detailed designs for the project hatcheries should have been completed prior to project appraisal, particularly due to the fact that there was sufficient time lag between project preparation and appraisal. These designs were prepared during implementation, and the disagreement on the sites as well as the uncertainties on the type and size of facilities and their viability clearly indicate that this question was not analyzed in detail during preparation and appraisal.

8.2 Supervision of the project by IDA was at regular intervals of six months during the first three years of implementation, and thereafter on a yearly basis until closure of the project.

Because of staffing constraints, a supervision mission planned for May/June 1992 could not be carried out. During the later period of the project, the Bank's Resident Mission was fully responsible for the supervision, and its regular involvement with project work, constructive dialogues and rapport with the executing agencies were strong features, yielding several institutional benefits to these agencies. IDA also maintained staff continuity during the nine missions it fielded. However, there were a few shortcomings. Most supervision missions did not include expertise to cover technical aspects of shrimp culture and hatchery designs, for which the missions heavily depended on the technical staff of the project consultants firm (para 12.1), whose services were not extended after the first phase. Had there been a shrimp hatchery design specialist on these missions, most of the problems related to these hatcheries could have been resolved at a very early stage. The technical advice given by supervision missions on the construction of civil works was appreciated.

## **9. Borrower Performance**

9.1 The performance of the Borrower in carrying out its obligations was poor. The project start-up was delayed because the Borrower took eight months to meet the Credit effectiveness conditions (para 5.1). During implementation a major problem was the delayed compliance with the cost recovery covenant, which was reviewed at appraisal and agreed at Credit negotiations. There were also problems, such as delays in land acquisition and civil works procurement, and delayed release of funds, all of which resulted in delays in completion of civil works. Further, many of the implementation constraints could have been resolved expeditiously if the senior management of BWDB and PIU/DOF and the concerned Ministries had intervened at the very early stages. Their interventions were more pronounced at the later stages and resulted, for example, in resolving the land acquisition case in the Cox's Bazar area. The Borrower also failed to provide funds in the revenue budget for post-implementation O&M; as a result, the work in the hatcheries and demonstration farms has come to a virtual halt, and BWDB is unable to carry out any maintenance on the civil works and regulators constructed under the project. The shortage of funds is likely to undermine the gains achieved under the project. On the positive side, however, PIU's performance was impressive in terms of achieving project objectives through extension and training efforts.

## **10. Lessons Learned**

10.1 The main lessons learned from the experience of this project are:

- (a) The O&M program during construction and after project completion, including financing of these activities, should have been well defined at appraisal, discussed with beneficiaries and the Government, and agreed in terms of responsibilities. The involvement of the beneficiaries in the early stages would lead to farmer communities being aware of their responsibilities and taking an active part in maintaining the project-funded investments. Further, BWDB should fulfil its commitment in carrying out regular O&M, without which the investment would be lost and benefits not sustained.
- (b) The planned five-year project implementation period was short. Given the bureaucratic delays in land acquisition and award of contracts, which are all



common to Bangladesh, a longer implementation period would have been appropriate.

- (c) The NGO's role in organizing and motivating shrimp farmers facilitated the achievement of project objectives. The design of the IDA-assisted Third Fisheries Project has provided for such NGO support.
- (d) During project supervision, expertise appropriate to project works should be included in the missions. In the present case, the inclusion of an experienced shrimp culture/hatchery design specialist during supervisions would have been very beneficial.
- (e) Site selection and detailed designs for the project hatcheries and DFTCs should have been completed prior to appraisal, particularly because there was sufficient time lag between project preparation and appraisal.
- (f) A well-planned extension and training program greatly facilitates achievement of project objectives.

## **11. Project Relationship**

11.1 The achievements of the project, despite initial problems, are the result of cordial working relationships between IDA and the Borrower and between the various participating groups, including the extension services and the NGOs. Through its long association with Bangladesh fisheries (first assistance in mid-1970s), IDA has developed a good relationship with the key institutions involved in the subsector. The reasonable continuity of IDA staff involved with project supervision, in particular during the period when the Resident Mission took over supervision responsibilities, further strengthened the IDA-Borrower relationship and helped find acceptable solutions to problems encountered during project implementation--in particular, reaching a solution to the cost recovery covenant which initially had some disagreements. Early in project implementation, the relations between the staff of BWDB and PIU were somewhat strained, but over the years they became cordial. IDA's long association with the subsector and the Ministry of Fisheries and Livestock led to financing of the Third Fisheries Project in 1990, followed by a detailed Fisheries Sector Review in 1991.

## **12. Consulting Services**

12.1 The performance of the international consulting firm, appointed by IDA under the UNDP grant, was mixed (para 5.14). The firm provided satisfactory support to PIU in designing and implementing the extension program, establishing and operating the makeshift hatcheries and providing technical advice on BWDB's infrastructure works. However, the firm's support to the design and supervision of the PIU hatcheries was not satisfactory, as is apparent by the difficulties encountered in operating the hatcheries (para 5.9). Because of this unsatisfactory performance, payments on the final invoices submitted by the firm to PIU have been held up until all repairs to the facilities are satisfactorily completed. The detailed engineering designs for the civil works of polders in Cox's Bazar were carried out by a local consulting firm. There were initial problems because of protracted bureaucratic delays in

contract negotiations, but the assignment was satisfactorily completed within the contractual period. The performance of the NGO was effective in promoting beneficiary participation in the project.

### **13. Project Documentation and Data**

13.1 The SAR, the DCA and the Project Proforma provided a useful framework for GOB and IDA during project implementation. Progress reporting by both PIU and BWDB was regular and the quality of reporting was good. Furthermore, adequate information to finalize this PCR was contained in IDA supervision reports, which were very comprehensive, and in other project documents and correspondence available at the Bank, PIU and BWDB. The terminal report of the UNDP-financed technical assistance has not yet been submitted to GOB. A GOB project completion report constituted a useful input into the preparation of the PCR.

**PROJECT COMPLETION REPORT****BANGLADESH****SHRIMP CULTURE PROJECT****(Credit No. 1651-BD)****PART II: PROJECT REVIEW FROM BORROWER'S PERSPECTIVE****1. Bank's Performance**

1.1 The performance of the World Bank was satisfactory. The project problems were generally resolved in the bi-monthly meetings between the World Bank (RMB) and implementing agencies. During the implementation of the project, constructive discussions were made with the implementing agencies for the better performance of civil work and TA component funded by UNDP. Suggestions were given to Department of Fisheries (DOF) in preparing the Project Completion Report (PCR).

**2. Borrower's Performance**

2.1 DOF, Bangladesh Water Development Board (BWDB) and Bangladesh Bank (BB) were the main implementing agencies of the project. The project was revised because of price escalation, delay in civil works and delay in land acquisition. Also, because of the time required to complete the remaining construction works by the DOF and the BWDB, the project period was extended (para 4.1). BWDB could not complete the work, among others, due to delay in release of fund as per Annual Development Program (ADP) provision. After project completion in June 1993, farmers have been trained in the Teknaf Demonstration Farm and Training Centers (DFTCs) under the Bangladesh Aquaculture and Fisheries Research Unit (BAFRU) fund. In order to recover the O&M cost, GOB has already promulgated Acts and Regulations. BWDB now plans to collect O&M costs from the beneficiaries. The performance of the credit component was not satisfactory, because of some difficult credit procedures. Because of the project, production of shrimp and export earning have increased significantly. The extension and training activities, however contributed to achieving project objectives. After completion of the project in June 1993, both the agencies (DOF and BWDB) had submitted separate Project Concept Paper (PCP) to the Government of Bangladesh (GOB) for the completion of remaining works. GOB has taken initiative to provide funds in the ADP of 1994-95 for the completion of remaining works.

2.2 The completed project is now under the process of being transferred to the revenue budget of GOB and is expected to be transferred on or before June 1994. Pending transfer to revenue budget, GOB has allocated a fund of Tk 10 million to meet up the expenditures for salary and honorarium of officers and staff and for operation and maintenance of the hatcheries, extension and DFTC. GOB is also sanctioning Tk 0.5 million as revolving fund in connection with the running of the hatcheries properly.

2.3 For better management and coordination among the different agencies associated with shrimp farming, GOB has recently decided to set up a Shrimp Culture Board to promote development of shrimp culture. In the meantime a Shrimp Cell has been set up in the Department of Fisheries. This Cell has already started work. The experience so far achieved from the shrimp culture project, will be used in the activities of the Cell. The purpose of the Shrimp Cell is to provide culture techniques and management support and all types of information to the people who are directly and indirectly associated with shrimp farming. The interested shrimp farmers and entrepreneurs have started to contact the Shrimp Cell to get necessary information and advice on shrimp and shrimp farming. It is expected that the identification and selection of semi-intensive shrimp culture area and shrimp hatchery zone in the Cox's Bazar and Khulna region will be completed by June 1994. In the meantime, the site selection committee formed for this purpose, has already submitted its report to GOB.

2.4 A committee has also been formed by GOB formulate recommendations in connection with the construction of dykes and sluice gates by BWDB in the shrimp culture areas.

2.5 The first meeting of the committee was held on 25.4.94 under the chairmanship of the Director General of the Department of Fisheries. It is expected that the committee will submit a report to GOB for future development of the shrimp farming areas.

### 3. Lessons Learned

The lessons learned are as follows:

- 3.1 O&M of dykes, sluice gates should be undertaken from the normal budget of BWDB.
- 3.2 The land acquisition procedure should be more easier for the implementation of project.
- 3.3 BWDB should take immediate initiative for collection of cost recovery for the proper maintenance of sluice gates and dykes.
- 3.4 As per ADP provision fund release should be timely.

### 4. Relationship between the Bank and the Borrower

4.1 During the implementation of the Shrimp Culture Project there was a very good relationship between the Bank and the Borrower. The Borrower got all types of support in resolving both technical and financial problems. To complete the project in full shapes, the Bank was flexible and extended the project period by one and a half years.

### 5. Performance of Co-Financier

There was UNDP grant for payment of consultancy fee and training allowances. The UNDP grant was very much essential and helpful for proper execution of the project.

**PROJECT COMPLETION REPORT****BANGLADESH****SHRIMP CULTURE PROJECT****(Credit No. 1651-BD)****PART III: STATISTICAL INFORMATION****1. Related IDA Credits**

<b>Loan/Credit Title</b>	<b>Purpose</b>	<b>Year of Approval</b>	<b>Status</b>	<b>Comments</b>
Karnafuli Irrigation Project (Cr.605-BD)	Increase food crops, primarily rice, and assess impact of irrigation and flood control projects on fisheries.	1976	Completed in December 1984, four years after the original Credit closing date.	PPAR Nov. 1986
Rural Development I Project (Cr.631-BD)	Rehabilitate derelict ponds, organization of Thana fishery cooperatives, training and technical assistance.	1976	Completed in December 1981, two and a half years after the original Credit closing date.	PPAR Nov. 1986
Oxbow Lakes Fisheries Project (Cr.890-BD)	Develop underexploited oxbow lakes to increase fish production, improve fishermen's income, provide good quality fish seed and fingerlings, and train DOF staff.	1979	Completed in June 1986, two years after the original Credit closing date.	PPAR June 1989
Third Fisheries Project (Cr.2146-BD)	Stocking of flood plains to increase production and improve fishermen's income, develop coastal (shrimp) aquaculture for export, introduce culture-based fisheries to private ponds, and institutional development.	1990	On-going	Implementation of the shrimp culture component has been delayed by about two years, mainly due to delays in appointment of a design consultant by BWDB. The polder development planning approach is different from the Shrimp Culture Project approach. Under the Third Fisheries Project, the existing network of canals is used for supply and drainage purposes compared with excavation of new canals using acquired land.

## 2. Project Timetable

Item	Planned Date	Revised Date	Actual Date
Identification <sup>1/</sup>	May 1981	-	May 1981
Preparation	February 1983	May 1983	May 1983
Appraisal	September/October 1984	October/November 1984	October/November 1984
Negotiations <sup>2/</sup>	April 1985	June 1985	November 14, 1985
Board Approval	May 1985	-	January 14, 1986
Credit Signature	February 14, 1986		February 14, 1986
Credit Effectiveness	May 14, 1986	August 14, 1986 October 14, 1986	October 30, 1986
Project Completion	June 30, 1991	June 30, 1993	June 30, 1993
Credit Closing	December 31, 1991	June 30, 1992 December 31, 1992 February 28, 1993 June 30, 1993	June 30, 1993 <sup>3/</sup>

<sup>1/</sup> The project was identified during the course of supervision of the Oxbow Lakes Fisheries Project (Cr.890-BD).

<sup>2/</sup> Negotiations delayed due to disagreement on size and scope of project.

<sup>3/</sup> Accounts were closed on October 31, 1993.

**Comments:** Issues raised at appraisal (decision making) were as follows:

**Legal Framework:** (i) Embankment and Drainage Act of 1952 to be revised by December 1984 to permit controlled flooding on land inside polders for brackish water shrimp and fish farming; (ii) long-term leases for Government-owned land to be given to groups of farmers and to individual farmers. The Decision Memorandum meeting agreed that Government should amend or prepare new regulations on item (i) before Board presentation. On item (ii) it was agreed that a dated Covenant in the DCA would specify a timetable for signing of all leases.

**Cost Recovery:** Recommendations were made for cost recovery of O&M at farm level and investment costs through an export cess (tariff). It was agreed that both O&M and investment costs should be recovered at farm level and that implementation of a program acceptable to IDA would be specified as a dated Covenant in the DCA.

**Financing:** The issue was meeting the gap in financing in view of the high project costs. It was agreed that IDA would increase its credit so that IDA and other external donors would finance 90% of total project cost net of duties and taxes.

**Retroactive Financing:** The issue concerned the expenditure made between appraisal and credit signature to be financed retroactively. It was agreed that retroactive financing would not exceed 10% of the IDA credit and this would cover pre-operative expenses for the recruitment of initial staff and for construction of the Department of Fisheries' administrative building.

### 3. Credit Disbursements

#### Cumulative Estimated and Actual Disbursements (SDR million)

IDA Fiscal Year	Appraisal Estimate	Actual	Actual as % of Estimate
1987	1,500	1,550	103
1988	3,700	3,152	85
1989	9,100	4,394	48
1990	13,600	7,594	56
1991	17,300	9,367	54
1992	20,000	11,367	57
1993	20,600	12,665	61
1994	20,600	13,543	66

Date of final disbursement: February 17, 1994.

#### 4. Project Implementation

##### A. Actual Implementation Versus Appraisal Estimate

	Unit	SAR Estimate	Revised	Actual	Actual as % of	
					SAR Estimate	Revised Estimate
<b>BWDB</b>						
Land Acquisition	Ha	531	499	499	94	100
Embankments	Km	197	148	142	72	96 <sup>1/</sup>
Regulators	No	80	67	61	76	91 <sup>2/</sup>
Drainage/Supply Canals	Km	104	220	150	144	68 <sup>3/</sup>
Boats and Vehicles	No	43	37	23	53	62
<b>PIU</b>						
Land Acquisition	Ha	26	26	24	92	92
Constr. of DOF Building	M2	540	540	540	100	100
Constr. of PIU Office	NO	2	2	1	50 <sup>4/</sup>	50 <sup>4/</sup>
Constr. of Hatchery	NO	2	2	2	100	100
Constr. of Demonstration Farm and Training Center	NO	2	2	2	100	100
Constr. of DOF Residential Buildings	M2	3,379	3,713	3,108 <sup>5/</sup>	92	84
Boats and Vehicles	No	38	36	36	95	100
Boats and Vehicles (Consultants)	No	16	21	21	131	100
Consultant Foreign	mm	120	134 <sup>6/</sup>	128	107	96
Consultant Local	mm	1,049	2,623 <sup>7/</sup>	2,623	250	100
Training Foreign <sup>8/</sup>	No	23	71	71	309	100
Training Local <sup>9/</sup>	No	-----	-----	1,730	-----	-----

- 1/ At Cox's Bazar, Polder 70, a 6 km retirement has to be constructed to complete the peripheral embankment. It could not be completed due to opposition by owners to hand over the land. Using GOB's emergency powers, the land was finally taken over late in the construction season of FY92/93. The retirement is scheduled for completion during FY94 under the Food For Work program.
- 2/ At Polder 70, one regulator was dropped and 5 regulators were about 86% as of June 30, 1993. Works financed by GOB's own resources are scheduled for completion in FY94.
- 3/ At Cox's Bazar, Polders 66/3, 66/4, and 70, a part of the internal embankment along the drainage/supply canals has not been completed due to the opposition of salt farmers to hand over the land needed for construction purposes, and also as the construction season is limited to one month due to the salt/shrimp cropping pattern.
- 4/ Because of civil works delays, the Khulna Office could not be constructed. The office is now proposed to be constructed with civil works funds from the IDA-assisted Third Fisheries Project and the Asian Development Bank-assisted Second Aquaculture Project, and GOB's own funds.
- 5/ For reasons mentioned in (4) above, the Khulna Residential Buildings could not be constructed. The buildings are proposed to be constructed based on the arrangements mentioned in (4/) above.
- 6/ During extension of the project period, 10 man-months of a Hatchery Specialist and 4 man-months of an Aquaculturist for the DFTCs were provided. However, 8 man-months of a Hatchery Specialist were used as PIU decided to conduct hatchery operations on their own. An Aquaculturist was identified but subsequently the candidate expressed his inability to join the project. PIU decided to conduct DFTC operations using own staff. However, some support was provided by the Hatchery Specialist.
- 7/ The man-months increased mainly because of extension of the NGO contract during the extended phase of the project.
- 8/ Number refers to persons trained. At appraisal, only a notional number of persons to be trained was provided. Details were to be estimated by Project Consultants.
- 9/ Number refers to courses. At appraisal, number of courses was not provided. Details were to be estimated by Project Consultants.



4. **Project Implementation****B. Construction Schedule**

(by Fiscal Year)

BWDB Works	Commencement		Completion		Number of Years	
	Appraisal	Actual	Appraisal	Actual	Appraisal	Actual
<b>Khulna</b>						
Polder 20/1	88	88	89	89	2	2
Polder 20	88	88	89	90	2	3
<b>Cox's Bazar</b>						
Rampur Polder 1	88	88	89	91	2	4
Rampur Polder 2	88	88	89	90	2	3
Rampur Polder 3	88	88	89	91	2	4
Rampur Polder 4	88	88	89	91	2	4
Rampur Polder 5	88	88	89	92	2	5
Polder 66/3	89	90	90	93	2	4 <sup>1/</sup>
Polder 66/4	89	90	90	93	2	4 <sup>1/</sup>
Polder 70	89	91	90	94	2	4 <sup>1/</sup>
<b>PIU Works</b>						
<b>Khulna and Cox's Bazar</b>						
Hatcheries (2 Nos)	88	90	88	92	1	3
<b>Demonstration Farms (2 Nos)</b>						
Khulna	87	90	88	92	2	3
Cox's Bazaar	87	90	88	93	2	4
Residential Buildings	88	90	89	92	2	3
Functional Buildings	87	90	88	92	2	3

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<sup>1/</sup> Some work has yet to be done on the internal embankments along the drainage and supply canal.

## 5. Project Cost and Financing

### A. Project Costs<sup>1/</sup>

Component	Appraisal Estimate (US\$ '000)	Estimated Actual (US\$ '000)	Actual as % of Appraisal
Infrastructure <sup>2/</sup>	13,900	16,593 <sup>3/</sup>	119
Credit			
On-farm	8,900	448	5
Private Hatcheries	2,600	118	5
Marketing	700	0	-
Institutional Support			
DOF <sup>4/</sup>	4,000	4,235	106
BWDB <sup>5/</sup>	2,200	2,538	115
TA & Training			
Implem. Consultants	4,000	3,274	82
Training & Fellowships	400	184	46
<b>Total Cost</b>	<b><u>36,700</u></b>	<b><u>27,390</u></b>	<b>75</b>

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<sup>1/</sup> Costs include physical and price contingencies.

<sup>2/</sup> Includes cost of land, construction of embankments, drainage channels, bridges, culverts, etc.

<sup>3/</sup> Includes estimated US\$1.0 million of unpaid expenditure and therefore unclaimed from IDA.

<sup>4/</sup> Includes construction of PIU office and residential buildings, DFTCs, hatcheries, purchase of vehicles and equipment, salaries and operating expenses.

<sup>5/</sup> Includes purchase of vehicles and equipment, salaries and operating expenses.

## 5. Project Cost and Financing

### B. Project Financing

Source	Appraisal Estimate US \$'000	Actual US\$'000	Actual as % of Appraisal
<b>A. IDA</b>			
Civil Works	11,100	13,221	119
Equipment and Vehicles	850	680	80
(a) Loan under Part B (I)	3,750	122	3
(b) Loan under Part B (II)	2,150	0	-
Staff Salaries & Oper. Expenses	2,150	2,395	111
Unallocated	2,000	1,532	77
<b>Subtotal</b>	<b>22,000<sup>1/</sup></b>	<b>17,950<sup>2/</sup></b>	<b>82</b>
<b>B. UNDP</b>			
Technical Assistance	4,500	3,458 <sup>3/</sup>	77
<b>C. GOB</b>			
	4,500	5,538 <sup>4/</sup>	123
<b>D. PBs</b>			
	2,400		
<b>E. Bangladesh Bank (BB)</b>			
	1,400	409 <sup>5/</sup>	11
<b>F. Investors</b>			
	1,900	35 <sup>5/</sup>	2
<b>Total</b>	<b><u>36,700</u></b>	<b><u>27,390</u></b>	<b>75</b>

<sup>1/</sup> Per Credit Agreement.

<sup>2/</sup> Per IDA Disbursement Records as of 09/30/93.

<sup>3/</sup> Per UNDP Office, Dhaka.

<sup>4/</sup> Per DOF and BWDB records. Includes expenditure of US\$1.0 million not claimed from IDA.

<sup>5/</sup> Mission estimate.

## 6. Project Results

### A. Direct Benefits

	Appraisal Estimate	PCR Estimate
<b>Benefitting Area</b>		
Main Project Area (ha):	7,000	6,180
Additional Area (ha):	2,500	2,965
<b>Incremental Production (Main Project Area) at Full Development</b>		
Exportable Shrimp (tons):	1,478	1,200 <sup>1/</sup>
Misc. Fish and Shrimp (tons):	1,840	
Paddy (tons):	114	n.a. <sup>2/</sup>
<b>Production at Full Development of Juveniles in Project Hatcheries <sup>3/</sup> (million):</b>	110	n.a.
<b>Benefitting Farm Families:</b>	3,700	4,300

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<sup>1/</sup> Estimated 40% incremental exports between 1987-1993.

<sup>2/</sup> Data not available.

<sup>3/</sup> Difficult to make any estimate because hatcheries need repairs and operating funds (Part 1, paras 5.9 and 6.3)

## 6. Project Results

### B. Financial Impact

	Appraisal Estimate <sup>1/</sup> (Taka '000)	PCR Estimate (Taka '000)
<b>Net Farm Incomes</b>		
Shrimp/Paddy Rotation (1.0 ha)	63.7	35.9
Shrimp/Salt Rotation (1.0 ha)	62.5	45.4
Shrimp Monoculture (1.0 ha)	66.9	53.3

<sup>1/</sup> Increased by a factor of 1.52 to bring them into equivalent 1993 prices. The PCR estimates are overall lower than the SAR because of comparatively higher production costs and low output prices particularly for paddy.

### C. Economic Impact

	Appraisal Estimate	PCR Estimate
Economic Rate of Return (ERR)	27%	20%

1. The overall economic impact of the project has been substantial. Besides increasing personal incomes and the quantity of exports, thus boosting the country's foreign exchange earnings, there have been other unquantifiable benefits such as job creation, particularly in the construction sector, and better environmental ambience for the shrimp farming communities because of improved infrastructural facilities.

2. The PCR ERR calculation does not include the incremental benefit from the additional areas which were not included in the SAR. If these benefits were included, the estimated PCR ERR would increase to over 25%. The PCR ERR would also have been higher if there were no delays in the construction of the infrastructure. The delays resulted in the bulk of project benefits being realized two or three years later than anticipated, thus depressing the PCR ERR estimate.

## 7. Status of Major Covenants

DCA Section	Covenant	Original Date	Revised Date	Status
3.01 (a)	Borrower to carry out project in conformity with appropriate administrative, financial engineering and fisheries practices, and provide funds facilities, services and other resources required.	Not specified.	-	Complied with.
3.01 (c)	Borrower shall ensure that adequate funds will be allocated to BWDB for the operation and maintenance (O&M) of project facilities.	Not specified.	-	Not complied with.
3.02 (d)	Borrower shall ensure short-term credit to ultimate Borrowers by PBs and refinanced by BB.	Not specified.	-	Complied with.
3.04	Borrower shall select additional project areas satisfactory to IDA and shall furnish, for approval, proposals for inclusion of such areas in the project.	Not specified.	-	Complied with.
3.06	Borrower shall submit land acquisition plans to Deputy Commissioners nine months before land is needed for construction, and provide funds, vehicles, survey equipment and staff necessary for verification and approval of land acquisition plans.	Not specified	-	Complied with difficulties. Land acquisition was delayed.
4.01 (b)(i)	Borrower to have all accounts for each fiscal year audited by independent auditors.	Not specified	-	Complied with.
4.01 (b) (ii)	Borrower to submit audited statements to IDA.	Within 9 months of end of each fiscal year.	-	Complied with, although often with delays in submission.
4.01 (c) (i)	Borrower to maintain separate records and accounts for all expenditures with respect to which withdrawals are requested from the Credit Account on the basis of statements of expenditure.	Not specified.	-	Complied with.

## 7. Status of Major Covenants

DCA Section	Covenant	Original Date	Revised Date	Status
4.02 (a)	Borrower to enact legislation and set recovery charges to ensure full cost recovery within a 20-year period.	Dec. 31, 1987	Feb. 28, 1993	Complied with. Cost Recovery Bill was passed by Parliament in October 1992 and the Cost Recovery Rules were in effect from February 28, 1993. The Bill and the Rules provide for full recovery of O&M costs through a direct levy on beneficiaries. Actual recovery, however, has yet to start.
4.02 (b)	Borrower make biennial adjustments to charges warranted by actual investment and O&M costs.	Biennially	-	Not yet effective.
Schedule 4.1	Borrower will establish, maintain and operate PIU, appoint Project Director and an Asst. Director Extension.	Not specified.	-	Complied with.
4.2 (i)	PIU to assist in monitoring and evaluation of production.	Not specified.	-	Complied with.
4.2 (ii)	PIU to set up O&M committees in each shrimp farming block under the project.	Not specified.	-	Complied with.
4.2 (iii)	PIU to liaise closely with BWDB.	Not specified.	-	Complied with after initial difficulties.
4.2 (iv)	PIU to carry out training activities in accordance with a training plan approved by IDA.	Dec. 31, 1986/Dec 31 thereafter	-	Complied with. However, the first plan was submitted in June 1987, after appointment of the consulting firm in March 1987.
4.3 (i)	BWDB to operate two separate Field Divisions, each headed by an Executive Engineer (EE), under the supervision of a Superintending Engineer.	Not specified.	-	Complied with.

## 7. Status of Major Covenants

DCA Section	Covenant	Original Date	Revised Date	Status
Schedule 4.3 (ii)	BWDB to designate two Superintending Engineers, each to be responsible for the work of the respective EE.	Not specified.	-	Complied with.
4.4 (i) & (ii)	Borrower to grant saline water intake permits for the Project Area and long-term leases (not less than 10 years) in public land to shrimp farmers in Rampur Polder.	Dec. 31, 1986	-	Complied with.

## 8. Use of IDA Resources

### A. Staff Inputs (Staff Weeks)

Stages of Project Cycle	Planned	Revised	Actual
Through Appraisal	n.a.	n.a.	264.0
Appraisal through Board Approval	n.a.	n.a.	9.8
Board Approval through Effectiveness	n.a.	n.a.	10.2
Supervision	62.1	77.1	118.0



8. Use of IDA Resources

B. Missions

Stage of Project Cycle	Month/Year	No. of Persons	Days in Field	Specialization Represented <sup>1/</sup>	Performance Rating Status <sup>2/</sup>	Type of Problem <sup>3/</sup>
Identification <sup>4/</sup>	May 1981	n.a.	n.a.	n.a.	-	-
Preparation	May 1983	n.a.	n.a.	n.a.	-	-
Appraisal	Oct/Nov 1984	6	n.a.	n.a.	-	-
Supervision 1	August 1986	5	12	AE, A, PO, CE, F	2	M, C
Supervision 2	April 1987	3	12	IE, CE, F	2	M, C
Supervision 3	Oct/Nov 1987	5	14	CE, IE, F, AE, PO	2	M, C
Supervision 4	May 1988	4	24	AE, PO, IE, F	2	M, C
Supervision 5	October 1988	5	30	AE, PO, CE, F, CE	2	M, C
Supervision 6	May/July 1989	5	24	PO/TM, CE, DO IE, F	2	M, C
Supervision 7	August 1990	4	24	PO/TM, DO, IE, F		M, C
Supervision 8 <sup>5/</sup>	June 1991	2	27	PO/TM, IE	2	M, C
Supervision 9	Jan/Feb 1993	3	21	PO, DO, CE	2	M, C

1/ AE = Agricultural Economist; A = Agriculturalist; CE = Civil Engineer; F = Fisheries Specialist; IE = Irrigation Engineer; PO = Program Officer; TM = Task Manager; DO = Disbursement Officer.

2/ 1 = Problem free or minor problems; 2 = moderate problems; 3 = major problems

3/ M = management, mainly related to delays in civil works; C = Compliance with Legal Covenant, mainly related to cost recovery

4/ Project was identified in the course of supervision of the Oxbow Lakes Project (Cr. 890-80).

5/ Because of staffing constraints, a supervision mission planned for May/June 1992 could not be carried out. An internal desk review was, however, done.

C. COSTS

Data are not available on cost of staff inputs broken down by each stage of the project cycle.

**BANGLADESH**  
**SHRIMP CULTURE PROJECT**

**ANNEX 1**

**FINANCIAL AND ECONOMIC ANALYSIS**

BANGLADESH  
SHRIMP CULTURE PROJECT  
PROJECT PRODUCTION, COSTS AND MARGINS

A. SHRIMP \1

YEAR	AREA		TOTAL	PRODUCTION (MT)			AVERAGE PROD/HA (KG)		
	COX'S	KHULNA		COX'S	KHULNA	TOTAL	COX'S	KHULNA	TOTAL
1987	5151	756	5907	334.8	51.4	386.2	65.0	68.0	65.4
1988	4931	937	5868	470.7	86.2	556.9	95.5	92.0	94.9
1989	4979	1219	6198	548.2	160.9	709.1	110.1	132.0	114.4
1990	6704	2163	8867	782	283.9	1065.9	116.6	131.3	120.2
1991	6607	2223	8830	567.6	501.9	1069.5	85.9	225.8	121.1
1992	6114	2234	8348	1453.8	626.9	2080.7	237.8	280.6	249.2
1993 \2	6900	2245	9145	1624.5	773.2	2397.7	235.4	344.4	262.2

YEAR	PROD. COSTS (TK 000)			GROSS INCOME (TK 000)			MARGIN PER HA (TK 000)		
	COX'S	KHULNA	TOTAL	COX'S	KHULNA	TOTAL	COX'S	KHULNA	TOTAL
1987	10379	4128	14507	53570	6426	59996	8.38	3.04	7.70
1988	17743	6258	24001	78834	12930	91764	12.39	7.12	11.55
1989	21652	12799	34451	92638	24136	116774	14.26	9.30	13.28
1990	30665	20430	51095	101966	43454	145420	10.64	10.64	10.64
1991	33786	33278	67064	100074	64796	164870	10.03	14.18	11.08
1992	59500	37623	97123	246507	80984	327491	30.59	19.41	27.60
1993 \2	66486	46416	112902	259490	105783	365273	27.97	26.44	27.60

\1 Original and Additional Areas

\2 Estimates because final figures were not available at the time of the PCR mission's visit.

Source: PCU, Dhaka.

BANGLADESH  
SHRIMP CULTURE PROJECT  
PROJECT PRODUCTION

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B. PADDY

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YEAR	AREA	PRODUCTION (MT)	PRODUCTION PER HA
1987	0	0	0
1988	1214	1569	1.29
1989	1196	2447	2.05
1990	1190	2329	1.96
1991	1186	2529	2.13
1992	1195	1999	1.67
1993	1195	2500	2.09

SOURCE: PIU, Dhaka.

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 C. HATCHERIES  
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Cox's Bazar -----	P.Monodon (Bagda) -----	M. Rosenbergii (Golda) -----	Macrobrachium -----
<b>1989</b>			
Larvae	300000	300000	
Post Larvae	118900	29375	
<b>1990</b>			
Larvae	4200000	3500000	
Post Larvae	213600	52411	
<b>1991</b>			
Larvae	\1 0		
Post Larvae	\1 0	0	
		0	
<b>1992</b>			
Larvae	\1 0	2800000	
Post Larvae	\1 0	600000	
<b>1993</b>			
Larvae	1000000	2800000	
Post Larvae	34000	51500	
<b>Khulna -----</b>			
<b>1992</b>			
Post Larvae			<b>318000</b>
<b>1993</b>			
Post Larvae			<b>10000</b>

\1 No production because of cyclone damage to the hatcheries

Source: PIU Cox's Bazar and Khulna

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BANGALDESH  
SHRIMP CULTURE PROJECT  
MODELS \1

		SHRIMP MONOCULT. (1.0 Ha)	SHRIMP/ PADDY (1.0 Ha)	SHRIMP/ SALT (1.0 Ha)
<b>PRODUCTION</b>				
Shrimp	(Kg)	450	300	300
Paddy	(Kg)		1673	
Salt	(Kg)			50000
<b>PRICE (Tk/Kg)</b>				
Shrimp		200	200	200
Paddy			5	
Salt				1.25
<b>GROSS REVENUE (Tk)</b>				
Shrimp		90000	60000	60000
Paddy			8365	
Salt				62500
<b>TOTAL REVENUE</b>		90000	68365	122500
<b>COSTS – SHRIMP (Tk)</b>				
Cost of Fry	(25000 & 15000 fries)	8750	5250	5250
Cost of Lime	(750 & 400Kg)	4500	2400	2400
Organic Fertiliser		2000	1000	1000
Chemical Fertiliser		2000	1050	1050
	(100Kg TSP & 50Kg Urea)			
Pesticide		6000	3500	3500
Maintainance of gate etc		5000	3000	3000
Lease		0	7000	7000
Others		5000	3500	3500
Finance Costs	\1	3491	2804	2804
<b>COSTS – PADDY</b>				
			3000	
<b>COSTS – SALT</b>				
Labour	(500 man – days)			37500
Water Management Tools				2000
Baskets				1200
Spread				200
Rollars				2000
Lease				
Others				200
Finance Costs	\2			4525.5
<b>Total</b>		36741	32504	77129
<b>MARGIN</b>				
– With Project		53259	35862	45371
– Without Project	\3	14330	4589	26486
– Incremental		38929	31273	18885

\1 It was not possible to obtain data on the investment costs necessary to complete these models.

\2 Estimated at 70% of total costs at an interest charge of 15%

\3 Based on SAR and inflated by a factor of 1.52 to express them in 1993 constant figures.

BANGLADESH  
SHRIMP CULTURE PROJECT  
PROJECT COST

(TK 000)

	1986/7	1988	1989	1990	1991	1992	1993	TOTAL
<b>1. BWDB RESPONSIBILITY</b>								
Total Costs (Infrastructur, Equip&Veh, O&M)	4338	57923	86967	102606	119990	146520	130392	648736
GOB Contribution	493	8786	10725	13624	51869	14319	52854	152670
<b>2. DOF RESPONSIBILITY</b>								
Land	0	740	830	0	1530	50	0	3150
PIU Building	2900	1250	0	0	800	1890	2510	9350
Demo. Farms and TCs	0	0	0	3530	9610	6080	2300	21520
Hatcheries	0	0	0	940	2670	3110	1640	8360
Residential Buildings	0	0	0	0	0	2630	17710	20340
Vehicles and Equipm.	5780	20020	1050	220	1000	130	2150	30350
Salaries and Op. Exps.	3510	4670	5110	7810	7010	9110	11610	48830
Others	0	240	0	0	0	350	0	590
Sub-Total	12190	26920	6990	12500	22620	23350	37920	142490
Consultants	5190	18490	15560	20700	17620	3850	3500	84910
Training Allowances	0	2290	2800	0	0	0	800	5890
Sub-Total	5190	20780	18360	20700	17620	3850	4300	90800
Total DOF	17380	47700	25350	33200	40240	27200	42220	233290
GOB Contribution	2020	12320	1490	1050	3980	6060	9660	36580
<b>3. CREDIT</b>								
	0	0	2696	1620	3183	3562	5822	16883
<b>TOTAL PROJECT COST</b>	<b>21718</b>	<b>105623</b>	<b>115013</b>	<b>137426</b>	<b>163413</b>	<b>177282</b>	<b>178434</b>	<b>898909</b>

\1 1993 BWDB figure includes Tk40 million estimated expenditure incurred but not claimed from IDA. It will ultimately be borne by GOB.

Source: BWDB and DOF (PIU)

BANGLADESH  
SHRIMP CULTURE PROJECT  
KEY INDICATORS

	Rural Consumer Price Index	Average Inflation %	Annual Inflafors %	Average TK/\$ Exch. Rate
1987	424	14.9	1.52	30.63
1988	456	7.5	1.32	31.25
1989	475.1	4.2	1.23	32.15
1990	504	6.1	1.18	32.93
1991	551.3	9.4	1.11	35.67
1992	586.2	6.3	1.05	38.15
1993	n.a	4.5 (estimate)	1.00 (estimate)	40.00 (estimate)

Source: WB



BANGLADESH  
SHRIMP CULTURE PROJECT  
EXPORT PARITY PRICES OF SHRIMP

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			FINANCIAL	ECONOMIC	
			-----	-----	
C&F USA	\1	US\$/Kg	11.78	11.78	
Less Freight and Unloading		US\$/Kg	0.45	0.45	
FOB Bangladesh		US\$/Kg	11.33	11.33	
Exchange Rate		Tk/US\$	40	40	
FOB Bangladesh		Tk/Kg	453.2	453.2	
Less: Taxes		Tk/Kg	0	-	
Transport, Processing and Marketing Costs & Middlemen Margins		Tk/Kg	133.4	118.7	\2
Farmgate Price (Headless)		Tk/Kg	319.8	334.5	
Farmgate Price (Head-on)		Tk/Kg	207.87	217.4	

\1 Based on export mix of 25% sizes 13/15 and 31/35 to 61/70 at average price of US\$3.83 per Lb; and the remainder 75% being sizes 16/20 to 26/30 at an average price of US\$5.87 per Lb.

\2 Financial Cost converted using SCF of 0.89 as advised by WB

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BANGLADESH  
SHRIMP CULTURE PROJECT  
ECONOMIC ANALYSIS

(Expressed 1993 Constant Tk000)

Project Year	Investment Costs	Operating & Other Costs	Incremental Prod. Costs	Incremental Prod. Value
1	30694	0	0	0
2	129914	0	33494	47327
3	131637	0	40513	79839
4	150929	0	44604	106976
5	168935	0	52639	65350
6	166130	0	46517	226960
7	156919	0	44329	262174
8	0	38557	44329	278979
9	0	40609	44329	278979
10	0	44743	44329	278979
11	0	38859	44329	278979
12	0	38625	44329	278979
13	0	38817	44329	278979
14	0	38581	44329	278979
15	0	39037	44329	278979
16	0	38557	44329	278979
17	0	40609	44329	278979
18	0	44743	44329	278979
19	0	38859	44329	278979
20	0	38625	44329	278979

Economic Rate of Return (ERR) = 20.16 %

Notes and Assumptions

1. The above analysis does not include the additional areas. If included, the ERR would improve to about 25%.
2. Economic Prices: Shrimp TK 217/Kg; Paddy Tk6.5/Kg; Salt TK 1.25/Kg (same as financial price).
3. SCF of 0.89 has been used.
4. Incremental production value relates to shrimp, paddy and salt attributable to the project.
5. Other Costs include replacements, O&M of infrastructure, salaries and other operating costs.

## **GUIDELINES FOR PREPARING O&M**

### **Procedures for Assessment of Levy**

1. The brief notes and guidelines given below could assist BWDB in the preparation of a proposal for implementing the cost recovery levy.

- (i) All works financed with public funds should be maintained effectively. Expenditures incurred by BWDB on the O&M of these works are recoverable from the beneficiaries. Expenditure would include all labor, materials, and operating costs of vehicles and equipment required. The salaries and allowances of all BWDB staff directly and solely working in the project would be charged in full. A percentage of the salaries of executive staff involved in project activities would be partly included in the cost.
- (ii) estimate the expenditure to be incurred by BWDB and beneficiaries according to the suggested guidelines described in the table below.
- (iii) BWDB and DOF should meet with O&M committees and also with a wide range of beneficiaries (farmers cultivating upper, middle and lower farms, owner and tenant farmers, and large and small holders). Activities and costs should be discussed, and agreements reached on the tasks to be performed by BWDB and farmers, the cost to be recovered, and the methodology to be adopted for the collection of the levy.

Table 1. Guidelines for Preparation of an Operation and Maintenance Plan and Assessment for Cost Recovery

(Page 1)

Activity	Details of Works	Frequency	Responsibility	Assessment Methodology
<b>OPERATIONS</b>				
1. Supervision	Patroling of embankments, canals, to check condition. Supervise O&M works	10 Km of embankment and canals within the reach, once a week	BWDB	A Works Assistant or Khalashi designated for each reach. Costed on a monthly basis for 12 months. Full cost to be allocated to the project.
2. Gate operations	Gate regulation. Assist BWDB staff in supervision of works under activity 1	As required	A beneficiary or an operator appointed and paid by the O&M committee	A gate operator for each sluice. Costed on the basis of actual time spent
3. Estimates for maintenance	Long.&Cross Sections of drainage canals. Measurement of repair of scours, damaged protection works etc. Preparation of estimates	As required 1/	BWDB	The Section Officer with a team of three skilled men to be responsible. Costed for the actual time spent.
4. Overheads			BWDB	A percentage of the Exen's and SDE's salary, and the full salary of SOs, Khalashis
<b>PREVENTIVE MAINTENANCE</b>				
1. Peripheral Embankment	Filling of rain cuts (runnels). Filling of minor slips in slopes, and at abutments and wing walls of structures. Repairing of rat holes, ghogs, and caverns formed due to bad compaction. Preventive works to stop piping immediately these are observed. Repairs to protection works. Slashing of vegetation particularly around structures. Replacement of grass at eroded or damaged sections. Preventing cattle damage. Maintaining reservations. Preventing squatting by people on crest and slopes of embankments. Preventing the planting of annual crops	Throughout the year.	Beneficiaies, with the technical advice of BWDB.	All earthworks and slashing operations should be on a km basis. Cost could be assessed on the basis of 4 cm spread of earthfill. Protection works at the initial stages of dispair could be carried out by benficiaries with materials supplied by BWDB. Security of the embankment could be organized by the PMC and Union Sub-committees.

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Table 1. Guidelines for Preparation of an Operation and Maintenance Plan and Assessment for Cost Recovery

(Page 2)

Activity	Details of Works	Frequency	Responsibility	Assessment Methodology
4. Drainage/Supply Regulators	Greasing of lifting rods and mechanisms. Removal of rust. Tightening of anchor bolts of headstocks. Checking and minor repairs to connection between gates and lifting rods. Minor repairs to protection works. Removal of debris particularly water hyacinth, and man made obstructions at gates.	As required	BWDB	A lump sum to be provided. Past expenditures could be the basis for costing. Cost would differ widely for each location.
2. Drainage/Supply canal	Removal of fish fences and man made obstructions. Checking and removal of water hyacinth at its early growth.	As directed by BWDB	Beneficiaries	BWDB staff and the gate operator, could identify requirements, and organize beneficiaries to carry out the work.
3. Secondary Embankment and Road	Maintenance of slopes at farmer constructed narrow wooden intakes. Filling of scours in slopes and crest. Prevention and repairs of unauthorized cuts.	Throughout the year	Beneficiaries	Could be estimated on the basis of 2 cms of fill and costed on an unit of a km.
4. Farm ridges and drains	Repairs to rat and crab holes in ridges, and removal of debris and obstruction in drains.	Throughout the year	Beneficiaries	Need not be costed
5. Tree plantations	Maintenance of trees, inclusive of controlled harvesting. Maintaining embankment slopes.	Throughout the year	Beneficiaries	The unit can be either on a km or number basis. Forestry Department or NGOs could assist in costing.
<b>PERIODIC MAINTENANCE</b>				
1. Peripheral Embankment	Earthfill of slips and breaches inclusive of grassing, caused by normal monsoon floods, and public cuts. Permanent works to arrest piping. Repairs to existing protection works, provided for arresting damage due to wave action and river bank erosion. Extension of protection works as required. Filling of scours on road and gravelling as required. Resectioning to design profile necessitated due to settlement.	Annually	BWDB	Data on damage repairs due to normal monsoon floods, wave action, and river bank erosion would be available with BWDB. Cost should exclude damage due to major floods or cyclones, bank erosion by major rivers, and wave erosion where the fetch is more than 0.5 km. Damage repairs due to cyclonic, above normal floods, and erosion by major rivers should be costed separately and works carried out by other means.

Table 1. Guidelines for Preparation of an Operation and Maintenance Plan and Assessment for Cost Recovery

(Page 3)

Activity	Details of Works	Frequency	Responsibility	Assessment Methodology
2. Drainage/Supply Regulators	Repairs and painting of gates and lifting mechanism. Replacement of damaged rubber seals. Repair or replacement of trashracks. Repair of eroded concrete sections, and damage to aprons, and protection works.	Annually	BWDB	A lump sum should be provided. Past records of BWDB would be useful in working out costs. Expenditure could be monitored effectively and changes made as required for future years.
3. Drainage/Supply canal	Removal of silt and earth to maintain design profile and bed level. Removal of water hyacinth.	Depends on location	BWDB	Silt removal could be on an unit of m <sup>3</sup> . The quantity and frequency of operation could be estimated on the basis of previous data. Water hyacinth clearing should be done annually and the unit could be m <sup>2</sup> .
4. Secondary Embankment and Road	Replacement of farmer constructed narrow wooden intakes by well designed wide intakes. Repair of breaches, road scours and gravelling as required.	Annually	Beneficiaries	If works were financed with public funds, it should be costed using an unit of m <sup>2</sup> . BWDB should ensure that beneficiaries carry out the work. If not BWDB should complete the work and include the cost in the levy.
5. Farm ridges and drains	Reconstructing farm ridges, and desilting of drains	Twice annually as required for the crop pattern	Beneficiaries	Not to be costed
6. Materials, Tools, Fuels, and other inputs	Supply of: cement, stone, sand, timber for concrete works; brick or stone for protection works; grease and paint; fuel and lubricants; jute bags and etc.; and tools.	Annually	BWDB	To be purchased and kept in BWDB stocks. Quantity to be decided on past requirements and replenished annually to maintain minimum requirements.

<sup>1/</sup> The SDE and SO should inspect the embankment before and after the monsoon and decide whether works could be estimated on the basis of tape measurements or engineering surveys. For desilting work of canals, surveys could be carried out according to the frequency of work.