

バングラデシュ国
洪水対策事業維持管理調査
事前（予備）調査報告書

平成5年4月

国際協力事業団

農 調 農

JR

93-31

JICA LIBRARY

1116051121

バングラデシュ国
洪水対策事業維持管理調査
事前（予備）調査報告書

平成5年4月

国際協力事業団

国際協力事業団

26862

序 文

日本国政府は、バングラデシュ国政府の要請に基づき、同国の洪水対策事業維持管理計画にかかる調査を実施することを決定し、国際協力事業団がこの調査を実施することとなりました。

当事業団は、本格調査に先立ち、本調査の円滑かつ効果的な実施を図るため、平成4年7月29日から8月14日までの17日間にわたり、駒沢大学文学部教授 宇和川正人氏を団長とする事前(予備)調査団を現地に派遣しました。

同調査団は、バングラデシュ国及びイギリス国政府関係者との協議並びに現地踏査を行い、要請背景・内容等を確認しました。

本報告書は、本格調査実施に向け、参考資料として広く関係者に活用されることを願い、とりまとめたものです。

終わりに、本調査にご協力とご支援をいただいた関係各位に対し、心より感謝申し上げます。

平成5年4月

国際協力事業団

理事 田口 俊郎

略語と用語の説明

1. 略語

ADB	: Asian Development Bank
AFPM	: Active Flood Plain Management
BRE	: Brahmaputra Right Embankment
BWDB	: Bangladesh Water Development Board
CIP	: Chandpur Irrigation Project
Compartmentalization	: 後述の用語説明参照
Controlled Flooding	: 後述の用語説明参照
EC	: European Economic Community
ERD	: External Resource Division, Ministry of Finance, GOB
FAP	: Flood Action Plan, 後述の用語説明参照
FPCO	: Flood Plan Coordination Organization 後述の用語説明参照
GOB	: Government of Bangladesh
GON	: Government of the Netherlands
IBRD	: International Bank for Reconstruction and Development (World Bank)
IDA	: International Development Association, 第2世銀
IOM	: Improved Operation and Maintenance
JICA	: Japan International Cooperation Agency
LGEB	: Local Government Engineering Bureau, Ministry of Local Government, GOB
MIP	: Muhuri Irrigation Project
MIWDFC	: Ministry of Irrigation, Water Development and Flood Control, GOB
M/M	: Minutes of Meeting, 議事録
NGO	: Non-government Organization
ODA	: United Kingdom Overseas Development Administration
O and M	: Operation and Maintenance
OFD	: On Farm Development
PIE	: Project Impact Evaluation method
Review Committee	: 後述の用語説明参照
RRA	: Rapid Rural Appraisal method
Scope of Work(S/W)	: 実施細則
SEADD	: South East Asia Development Division, ODA

SFD : Saudi Fund for Development, サウジ開発基金
Shortlist : 選択候補（地区）一覧表
SRP : System Rehabilitation Project, BWDB
TAPP : Technical Assistance Project Proforma, 後述の用語説明参照
Technical Committee : 後述の用語説明参照
TOR : Terms of Reference, 委任事項
UK : United Kingdom
UNDP : United Nations Development Programme
USAID : United States Agency for International Development,
WFP : World Food Programme of the UN

2. 用語

Concept of Controlled Flooding and Compartmentalization

引用 : (1) : UNDP/GOB : Bangladesh Flood Policy Study (May 1989),
(2) : FAP Progress Report, Quarterly, June, 1992, FPCO, GOB

- (1) Protected areas from the floods will be subdivided into 'compartments' managed locally to the extent possible. This concept is introduced to provide water control (controlled flooding and controlled drainage) to protected areas and a secure environment for intensive agriculture, fish farming and integrated rural development. Compartments, which are also needed to contain the areal extent of flooding in the event of any embankment breach, will provide focal units for flood preparedness and warning. Existing road and rail embankments should be used to protect compartments wherever they can be integrated into individual schemes.
- (2) The Flood Action Plan is being guided under a framework of a set of guiding principles which include the concept of controlled flooding and compartmentalization. In order to retain the beneficial effects, flood water will be allowed to spread over the land but in a controlled way and thus improving environment. Appropriate provisions will be made in the embankments in the form of ungated openings and gated structures. Their operation will depend on the needs of agriculture, fisheries, inland navigation etc. taking into account of direct rainfall in the area. The provisions for controlled flooding also serve to discharge excess water from the embanked areas through an efficient drainage channel system. Other important elements of the guiding principles are participation of beneficiaries at all stages of project, full considerations of environmental aspects in planning and emphasis on operation and maintenance issues.

FAP : Flood Action Plan Bangladesh

引用 : FAP Progress Report, Quarterly, June, 1992, FPCO, GOB

Following the disastrous floods of 1987 and 1988, the Government of Bangladesh undertook a comprehensive review of flood policy. A number of studies were carried out and, in June, 1989, the Government requested World Bank to develop and coordinate five-year Flood Action Plan (1990-95), drawing on these studies, as the first of several stages in the Government long term flood control program. The G7 Summit held in Paris in July, 1989, stressed the urgent need for

effective coordinated action by the International Community in order to find solutions to this major problem which are technically, financially, economically and environmentally sound.

The Flood Action Plan was prepared in December, 1989 by the World Bank in close cooperation with the Government of Bangladesh. It was formally endorsed at a meeting of Government of Bangladesh and Donor representatives in London, in December, 1989 and subsequent Dhaka Conference in January, 1990. The Action Plan aims at the identification, planning, design and construction of projects which are technically, economically, environmentally and socially feasible. The Plan follows a staged approach which will focus in the first years on regional studies of flood control and drainage, together with supporting activities, to provide inputs into the planning and design of the main components of this and subsequent Action Plans.

The Action plan comprises eleven plan components and fifteen supporting activities. It is coordinated by the Government of Bangladesh and the World Bank. The Action Plan is undertaken in parallel with agricultural and other rural development programs and a program of non-structural measures, including flood warning and flood preparedness.

<u>FAP NO.</u>	<u>Plan Components</u>	<u>Donor(s)</u>
1	Brahmaputra River Training Study	IDA
2	North West Regional Study	UK, JAPAN
3	North Central Regional Study	EEC, FRANCE
3.1	Jamalpur Priority Project	EEC
4	South West Area Water Managemnet Study	ADB, UNDP
5 A	South East Regional Study	IDA, UNDP
5 B	Meghna Estuary Study	NETHERLANDS, DENMARK
6	North East Regional Study	CANADA
7	Cyclone Protection Project	EEC
8 A	Greater Dhaka Protection Project	JAPAN
8 B	Dhaka Integrated Town Protection Project	ADB
9 A	Other Towns Protection Project	ADB
9 B	Meghna LB Protection Project	IDA
10	Flood Forecasting & Warning Project	UNDP, JAPAN, ADB

11	Disaster Preparedness Project	UNDP
	<u>Supporting Activities</u>	
12	FCD/1. Agricultural Review	UK, JAPAN
13	O & M Study	UK, JAPAN
14	Flood Response Study	USA
15	Land Acquisition and Resettlement	SWEDEN
16	Environment Study	USA
17	Fisheries Study and Pilot Project	UK
18	Topographic Mapping	FINLAND, FRANCE SWITZERLAND
19	Geographic Information System	USA
20	Compartmentalization Pilot Project	NL, GERMANY
21	Bank Protection & AFPM Pilot Project	GERMANY, FRANCE
22		
23	Flood Proofing Pilot Project	USA
24	River Survey Project	EEC
25	Flood Modelling /Managemnet Project	DENMARK, NL FRANCE, UK
26	Institutional Development Program	UNDP, FRANCE

EAP Organizations :

引用 : 1990 Annual Report, Bangladesh Action Plan for Flood Control, Asian Region Technical Dept. 27 January 1991
(World Banak)

- 1 The Government of Bangladesh established a National Flood Council and an Implementation Committee for the Action Plan in September 1989.. The Council, headed by the Present, meets periodically to review progress on the Action Plan and formulate policies needed to ensure timely implementation. The Implementation Committee, headed by the Minister of Irrigation, Water Developmnet and Flood Control (MIWDFC) and composed of the Secretary Irrigation, Secretary Finance and the Secretary External Resources Division ensures coordination between ministries and reviews and approves actions on major issues relating to the Action Plan. The Secretary Irrigation, as the highest level government officer with personal responsibility for the Action Plan, draws of the services of a Technical Committee which he chairs. InIn addition, a

full-time government body, the Flood Plan Coordination Organization (FPCO) was set up in early 1990 to provide day to day coordination of the Action Plan. The FPCO is in turn supported on technical and coordination matters by a Panel of Experts (POE) composed of local and international experts. The membership of the Technical Committee includes representatives from all relevant ministries and government agencies, including the FPCO, members of the POE, and the World Bank's Resident Coordinator.

- 2 The FPCO is supported by UNDP Project BGD/90/004 and is headed by a Chief Engineer. At present it has five Superintending Engineers and three Executive Engineers, all with considerable experience in project planning and design. They are supported by an experienced office staff well equipped with modern word processing and communications equipment. There are plans to expand FPCO in the near future and additional positions have recently been authorized. A full-time local member of the POE, provides day-to-day advice to the FPCO and shares the role of Chairman of the POE.

- 3 Local experts serving as part-time members of the POE are two Professors (BUET). The International members are from (UK) (Chairman of the POE), (Netherlands), (UK) and other donor countries. The POE is supported by UNDP Project BGD/89/046. The World Bank's Coordinator for the Action Plan, based in Washington, is a Division Chief in the Asia Region's Technical Department, and Bank's Resident Coordinator is full-time duties in Bangladesh in January 1991.

TAAP : Technical Assistance Project Proforma

引用 : 1990 Annual Report, Bangladesh Action Plan for Flood
Control, Asian Region Technical Dept. 27 January 1991
(World Bank)

For a typical Action Plan activity, the first draft of a TOR was written by experts fielded by the donors in consultation with the working groups, the POE, the FPCO and the Bank. Once the language was agreed, the FPCO produced the TOR in a standard format suitable for use by the donors in inviting proposals from consultants. At the same time FPCO prepared a Technical Assistance Project Proforma (TAPP), an internal document required for all technical assistance activities in Bangladesh. A TAPP summarizes the TOR, provides an estimate of inputs and costs financed by the donors, and identifies government counterpart

contributions in terms of budget and staffing. As they were completed, the TOR and TAPPs were submitted to a Technical Committee Meeting for approval. The Chairman of the TC reported on the meetings' findings to the Implementation Committee and obtained its approval. Approved TOR/TAPPs were passed for clearance to the Planning Commission, a process which was expedited by the fact that the Commission is represented on the TC. Until recently, all TAPPs had to be approved by the President's Office, but now a Project Concept Paper, (PCP) a much abbreviated form of TAPP prepared by the FPCO, is submitted to the President's Office by the Planning Commission through the Executive Committee of National Economic Council (ECNEC). Approval of the PCP by the President's Office constitutes approval of the TOR/TAPP. The above procedure was followed for most of the activities under the Action Plan.

Review Committee

引用 : M/M on FAP Review meeting, 7 April 1991, held at World Bank Resident Mission, Dhaka

One of the major tasks for FPCO is the review of the consultants' reports-inception, interim and final. The first series, the inception reports, will confirm the direction and approach the studies are to take, therefore it is important that the review process is carried out in a careful and integrated manner so as to ensure the consistency and comprehensiveness required by the Action Plan. Procedures have been formulated for the review and approval of inception reports, taking due account of the need to obtain the views of the various disciplines and organizations that will be involved in the planning and implementation of the particular FAP component.

The procedures, which are shown in Figure 1, would be subject to modification as experience is gained in the reviewing reports. The main steps are as follows:

1. The Consultant submits the report simultaneously to FPCO and the donor. In some cases the report is submitted to FPCO through the donor. The donor carries out its internal review.
2. The designated Superintending Engineer (FPCO SE) distributes copies to a predetermined list of reviewers.

3. The main review is carried out over a five-day period by the following groups:

- Local Panel of Experts
- International Panel of Experts
- World Bank Coordinator
- FPCO Team (staff supported by local experts)
- Designated officials from concerned
- Ministries /Agencies

The FPCO team will include professionals of the various disciplines to be covered by the particular FAP activity. FPCO will request the concerned Ministries or Agencies to send their experts participate in the review.

4. The comments are screened for duplication and any obvious inappropriateness, consolidated and categorised by FPCO SE (in the early reports with assistance from the Panels of Experts). The first category of comments is concerned with policy, which should be resolved at the ~~Review Committee Meeting~~ and the second contains technical comments which should be resolved between the Consultant and FPCO, these comments need not be discussed at the Review Committee Meeting unless a member so wishes. The third category contains corrections and comments of an informative nature, these are passed straight to the Consultant. The Review Committee members will not receive the latter comments unless there is a request. Copies of the report and category 1 and 2 comments are distributed to members of the Review Committee five days before they meet.

5. The Review Committee discusses and agrees the final form of the comments, approves the report and prepares a review paper. The Committee, which should not normally exceed 11 persons, comprises the following:

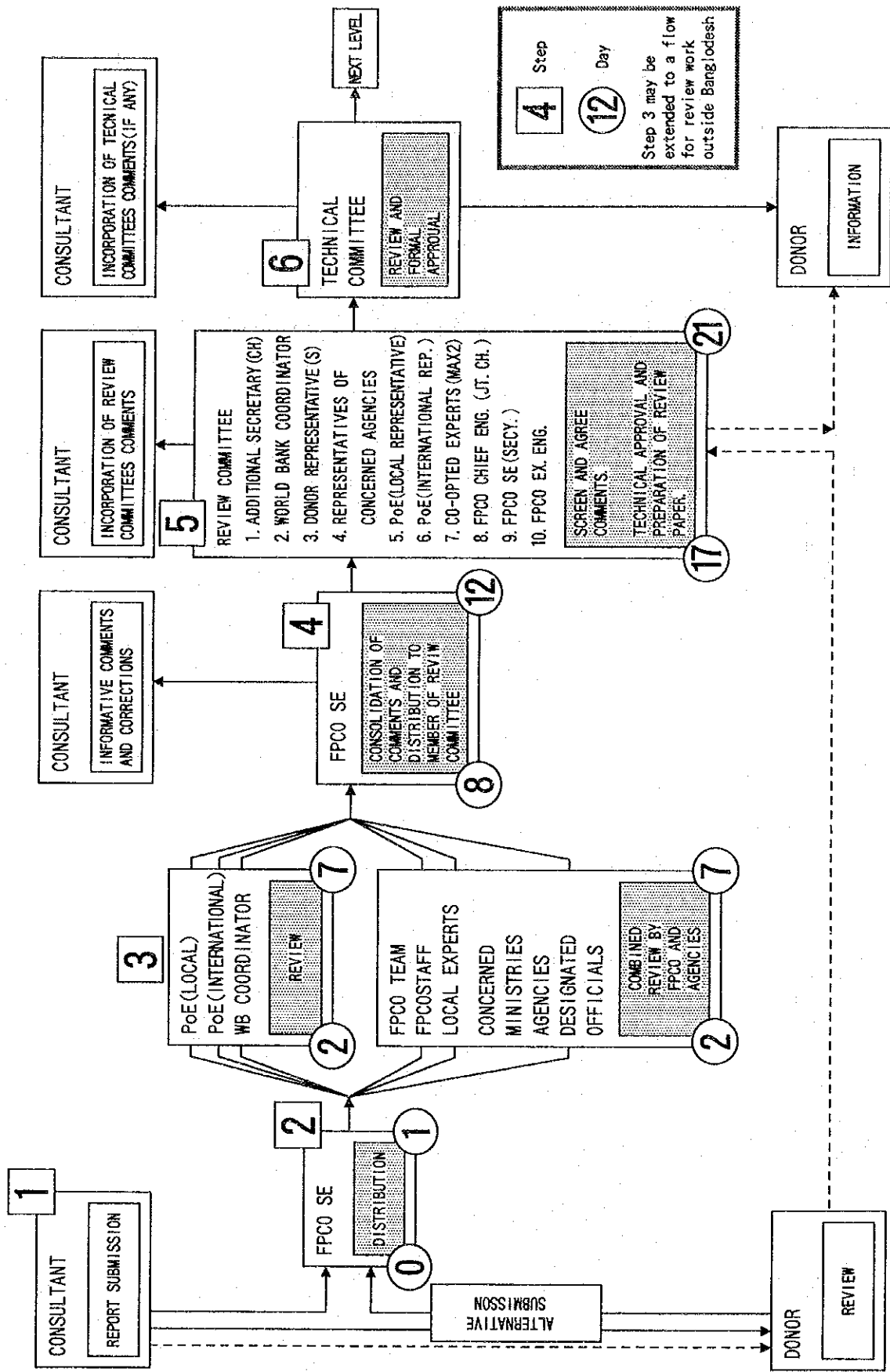
- Joint Secretary (MOIWD & FC)
- World Bank Coordinator
- Donor Representative(s)
- Concerned Ministry/Agency Representative(s)
- Panels of Experts Representatives
- Co-opted Experts
- FPCO Chief Eng., FPCO SE & FPCO Exec. Eng.

Donor agencies have their own review procedures which in some cases will be independent of FPCO's, however to achieve a coordinated approach, it will be an advantage if the donors' comments are raised at the meeting.

The time taken for the work of the Review Committee should not exceed three days, including passing the comments to the Consultants.

6. The Inception Report with the Review Paper are placed before the Technical Committee for consideration and formal approval.

PROCEDURES FOR REVIEW OF TYPICAL REPORT



目 次

序 文

略語と用語説明

1. 略 語
2. 用 語

1. 調査の背景	1
2. 調査団の構成／調査日程	5
3. 調査結果	11
1. FAP13 Phase IIに関する日本（JICA）とイギリス（ODA）との 協議と議事録（M／M）の締結	13
2. FAP13 Phase IIに関するTORの作成	14
2－1 8th Draft から10th Draftに至る経緯	14
2－2 FAP13 Phase II TOR（10th Draft, 10.8.92-Dhaka）	14
2－3 FAP13-II-B作業計画案	14
3. O&Mテストプロジェクトの選定	16
3－1 プロジェクトの選定基準	16
3－2 ショートリストの作成	16
4. 結論及び提言	23
1. 総 括	25
2. 施設維持管理	27
3. 農業及び農村社会	28
4. 実証計画	29
5. 関連資料／会議議事録／その他	31

1. 調査の背景

イギリス (ODA) / 日本 (JICA) による FAP13 (O&M Study) - Phase I 調査は、FAP12 (FCD/I Agricultural Review) と合同して 1991 年 1 月に開始され、1992 年 3 月に完了した。最終報告書 (FAP13 O&M Study Final Report, Hunting Technical Service Limited(英) / 三祐コンサルタンツ (日)、1992 年 3 月) は、FPCO の Review Committee meeting (1992 年 5 月 19 日) を経て、Technical Committee (T.C.) において認可 (1992 年 7 月 9 日) された。

FAP13 の TOR (25th March 1990) には、Phase I の調査結果を踏まえ、FAP 5 ヶ年計画における 2 年次から 5 年次までの調査計画 (案) の作成が要求されており、FAP13 Final Report の 7 章 (Outline work programme for years 2 to 5) に基本的な調査項目が解説され、それらの Scope of work (案) が提示された。

1992 年 5 月 7 日の FAP13 - Phase II 調査の TOR に関する三者 (イギリス・日本・バングラデシュ) 会議において、次のことが合意されている。(資料-11 議事録参照)

(1) Phase II 調査の実施に当たり、その目的達成のため、2 つの Sub-components (FAP13-II-A と FAP13-II-B) で分担して行う。

(2) FAP13-II-A

FCD/I の O&M 分野の設計、検討を FAPS、BWDB らと補完的に共同して実施し、それら比較得失検討の結果により得た改良 O&M を水開発プロジェクトにフィード・バックすることを目的とする。

UK/ODA により実施される。

(3) FAP13-II-B

パイロットベースでいくつかの改良 O&M について実証試験を行い、それらを水開発プロジェクトにフィード・バックすることを目的とする。

日本/JICA により実施される。

(4) Phase II の最終 TOR 及び TAPP 作成に必要な資料の提供が急がれる。

上述の三者合意に基づき、イギリス (ODA) 側は FAP13 Bridging Period (June-August 1992) として、FAP13 Phase I 調査の Team Leader Dr. Paul Tompson を、日本 (JICA) 側は 1992 年 7 月 29 日から 8 月 14 日まで本事前調査団をバングラデシュ国に派遣し、バングラデシュ政府機関と事前 (予備) 打合せを行った。

2. 調査団の構成／調査日程

調査の目的と範囲

本プロジェクト(FAP13 Phase II)にかかる全体計画・調査内容並びに、わが国が協力の対象とする調査 (FAP13-II-B) の範囲、内容等を確認するため

- (1) イギリス (ODA) との協調作業の内容・時期・協調方法にかかる協議及びM/Mの締結、
 - (2) わが国が協力の対象とする調査の範囲・内容・方法・スケジュール等を確認し、最終TORを作成する、
 - (3) 調査経費、具体的調査(作業)計画を検討し、TAPP作成に必要な資料をバングラデシュ国関係機関に提供する、
 - (4) 実証調査(O&M テストプロジェクト)の選定条件についてイギリス(ODA)、バングラデシュ側と打合せ、ショートリストを作成する、
 - (5) S/W内容及び協議・署名手順の打合せ
- について、イギリス(ODA)現地機関、バングラデシュ政府機関と交渉する。

調査団の構成

うわがわまさひと 宇和川正人	総括	駒沢大学文学部教授(自然科学教室)
よねだ ひろつぐ 米田 博次	施設維持管理	農林水産省関東農政局建設部 設計課農業土木専門官
くさの だいすけ 草野 大輔	農業	農林水産省九州農政局計画部 資源課営農指導第一係長
もとむら ひろみ 本村 洋	調査企画	国際協力事業団農林水産開発調査部 農業開発調査課
おおさと やすし 大里 安	農村社会	株式会社 建設企画コンサルタント 海外部長代理
あらい のりあき 荒井 徳昭	実証計画	株式会社 建設企画コンサルタント 海外本部担当部長

調査日程

月 日	曜	時間	日 程
7月29日	水	11:00	成田発 TG641
		15:30	バンコク着
30日	木	9:00	イギリスODAバンコク事務所にてMr. W. D. H. Roberts, Mr. John Hoy とFAP13-II調査についてのイギリス(ODA)/日本(JICA)の 議事録(M/M)作成のための打合せ (資料-2 議事録)
		午後	調査団協議・打合せ
31日	金	11:30	バンコク発 TG321
		12:50	ダッカ着
		午後	大使館打合せ
8月1日	土	9:00	E. R. D., Ministry of Finance 表敬訪問 Mr. D. Z. Hossain (Deputy Secretary, ERD, MOF) Mr. R. Islam (Assistant Chief, ERD, MOF)
		10:30	Bangladesh Water Development Board (BWDB) 表敬 調査団の目的等を説明 Mr. M. A. Razzaqu (Chairman, BWDB) Mr. A. R. Khan (Member, Implementation, BWDB) Mr. M. M. Islam (Member, O&M, BWDB)
		12:00	Flood Plan Coordination Organization (FPCO) 表敬 調査団の目的等説明、FAP13-II-BのTORの検討、O&M実証プロ ジェクトの協議 Mr. M. H. Siddiqui (Chief Engineer, FPCO) Mr. N. Huda (Chairman, Local POEs, FPCO) Mr. H. Rahman (Superintendent Engineer, FPCO)

月 日	曜	時間	日 程
2 日	日	9:00	J I C A 事務所打合せ
		11:00	British Embassy にてODA-Dhaka, Dr.Harry PotterとFAP13 Phase II のTOR案に関し打合せ(資料-3)
		12:30	F P C OにてFAP13-II-BのTOR(8th Draft) について協議 (資料-4)
3 日	月	午前	団内打合せ
		12:00	J I C A 事務所にてODA, Dr.Harry Potter, Mr.W. D. H. Roberts, Dr. Paul TompsonらとFAP13-IIのTOR及びODA/J I C AのM/Mに ついて打合せ
		午後	実証プロジェクト選定基準にかかわる団内協議
4 日	火	9:00	F P C Oとプロジェクト選定、TORに関する打合せ
		12:00	本村、荒井: ODAとFAP13-IIのTOR(9th Draft) 協議 (J I C A 事務所) Dr.Harry Potter Mr. W. D. H. Roberts Dr. Paul Tompson 団長、米田、草野、大里: SRP Officeにてプロジェクト選定作業 Mr. M. A. Rashid (Chief Engineer, SRP) Mr. Rafib Zaman (Director, Planning, BWDB) 他
5 日	水	9:00	ODA/J I C AによるM/M署名(資料-1)
		9:30	F P C OにてTOR(9th Draft) の検討
		14:30	宇和川、草野、米田、本村 ダッカ発 BG-082

月 日	曜	時間	日 程
6 日	木	9:00	F P C Oにて資料収集
		10:00	F P C OにてMr.Siddiqui(Chief Engineer, FPCO) とプロジェクト選 定基準打合せ
		午後	B W D Bにてプロジェクト選定作業
7 日	金		資料整理
8 日	土	9:00	B W D B Mr.A.R.Khan(Member-Implementation, BWDB) と打合せ
		10:00	Dhaka-Narsindgdi-Demra Project 現地調査
		14:00	Narayanganj-Narshingdi Project 現地調査
9 日	日	9:00	F P C Oにてプロジェクト選定作業
		10:30	Konai beel Project 現地調査
10 日	月	9:00	Dhaka O&M Division-1にて、Mr.Sharif R.Islam 他と実証地区につい て打合せ
		午後	イギリス O D A Dr.Potter, Mr.HoyとFAP13-IIの T O R (10th Draft) 作成
11 日	火	9:00	Sreenagar-Mawa Project 現地調査
12 日	水	10:00	F P C Oにて T O R (10th Draf) の協議 (資料-5 議事録)
13 日	木	9:30	J I C A バングラデシュ事務所にて調査報告
		10:30	大使館にて調査報告
		14:00	荒井、大里ダッカ発 TG-322
14 日	金	11:00	バンコク発 TG-640
		22:00	成田着

3. 調査結果

1. FAP13 Phase IIに関する日本(JICA)とイギリス(ODA)との協議と議事録(M/M)の締結
1992年7月30日(木)、在バンコクイギリス大使館にSEADD(ODA)事務所を訪ね、イギリス側の本件担当官Mr. Peter W. D. H. Roberts(Senior Engineering Adviser)とMr. John Hoy(Economic Adviser)らと協議した。会議の内容は資料-2 議事録のとおりで、特筆すべき事項は以下のとおりである。

- (1) イギリス側としても、日本からの事前(予備)調査団が現地入りする機会にバングラデシュ政府側との事前交渉を、協調して一挙に進捗させたい意向を持っており、FPCOとのTOR及びTAPPの打合せのため、本調査団の現地日程に合わせてMr. Robertsがダッカへ出張することとなった。(同氏は8月2日から5日までダッカに滞在した)
- (2) イギリス(ODA)/日本(JICA)とのM/Mの締結は、この機会に、ダッカで最終TORの段階に至るだろうからそれを踏まえて、M/M内容に決着をつけて、締結することを約した。(署名は8月5日にダッカで行われた)
- (3) イギリス(ODA)は、この1、2年の経験から、ダッカに新しく Aid Management Office を開設し7名の専門家を配置することになる。1992年末までに、現在バンコクで所掌している権限はダッカの Aid Management Officeに移譲される。既に、6週間前にチーフのDr. Harry L. Potter (1st Secretary, Natural Resources Adviser)がMs. Linda Brown (1st Secretary, Natural Resources Adviser, ODA Dhaka)の後任として着任しており、本調査団との交渉には、業務引継を兼ね、Mr. Roberts (ODA-Bangkok)とDr. Potter (ODA-Dhaka)が出席した。

イギリス(ODA)/日本(JICA)両ドナーサイドの協議議事録の締結署名は、ダッカで、1992年8月5日に、ODA側(Mr. Peter W. D. H. Roberts)とJICA側(本調査団 宇和川団長)によって行われた。このM/Mの内容は別添資料-1のとおりである。4th Draft が最終M/Mとなったが、特筆すべき事項は以下のとおりである。

- (1) 3.1 Offshore Inputsの記載は、このM/Mの段階では不確定要素が多いこと、また予算制度の建て前から暫定とはいえ、全調査期間の投入計画の記述を避けるべきであるとの点で両国双方は合意し、3・4年次の投入計画は2年次においてレビューすることにした。
- (2) 3.1.2 Responsibilities of JICAの記載は、ODA、JICAともに専門家の職種のみとし、このM/Mの段階ではman-monthsなどは記載しないこととした。

JICAにより実施されるFAP13-II-Bのチームリーダーは、この交渉と同時に進行していたTORの三者協議で、調査内容から、FCD/I プロジェクトのO&Mに経験を有するSenior Engineerにすることになった。ODA側のFAP13-II-Aチームのリーダーは Sociologistに決まりつつあるので、JICAからのEngineer(ハード)とODAからのInstitutions Specialist(ソフト)とのコンビで、所期の成果が期待される。

- (3) 4.4には、前述の、ODA（バンコク）からODA（ダッカ）への権限委譲に伴うODA側のContact Personの変更が明記された。

2. FAP13 Phase IIに関するTORの作成

2-1 8th Draftから10th Draftに至る経緯

8月2日午後、FPCOでおこなわれた、日本、ODA、FPCOの第2回会合で8th Draft（日本側の作業計画とInputsを盛り込んだもの）について協議が行われた。（資料-4 参照）

このMeetingの協議結果を踏まえ、8月3日、JICAバングラデシュ事務所にてODA側（Dr. Harry Potter, Mr. W. D. H. Roberts, Dr. Paul Tompson）と会合を持ち、8th Draftの組み方を修正した。

8月4日、JICA事務所にて、引き続きODA側3名と、TOR及びM/Mのドラフト・ファイナル作成を行った。TORは、この会合で若干の修正を行ったものを9th Draftとし、8月5日、FPCOにおいて調査団とODAメンバーは、FPCOに提示し検討を行った。

8月9日、ODA-Bangkok のMr. John Hoy がバングラデシュを訪れ、翌10日Dr. Potter とMr. Hoyと調査団員はTORの10th Draftを作成した。

8月12日、FPCOにて協議検討を行った結果、概ね、三者の合意に達した。

2-2 FAP13 Phase II TOR (10th Draft, 10.8.92-Dhaka)

資料-13に Draft Terms of References for Operation and Maintenance Study FAP-Phase IIとして添付した。

2-3 FAP13-II-B作業計画案

1 年次（1992年11月～1993年3月）

1. パイロットプロジェクトの選定

- a) 典型的な特徴を有する、完成直後またはO&M実施中の代表的なFCD/Iプロジェクトを選定する。

プロジェクトの選定はFAP13-II-A、FPCO及びBWDBと共同して行い、FAP13 Phase II及びその他の類似プロジェクトからなる約10箇所のショートリストから選定する。

- b) 選定したプロジェクトの現況の把握及び検討

2. 実証用O&Mガイドライン案の作成

- a) 既存のO&Mマニュアルの検討及び関係機関との協議
b) 各プロジェクト毎の実証用O&Mガイドライン案の作成
c) 既に見い出されているO&Mに関するFAP調査結果を検討後、FAP13-II-Aと共同して、パ

イロットベースでの実証試験に適した改良O&M案を作成する。

d) 政府関係機関、地方関係機関と共同して効果的な実証計画を確立する。

3. インセプションレポートの作成

(調査開始後3ヶ月以内)

4. 第1回ワークショップの開催

(FAP13-II-Aと共同開催)

5. その他

a) 農村社会・農業に関する実態調査

農家調査、農家経済経営調査、農業生産流通調査、農業基盤調査、農業調査など

b) FCD/IプロジェクトのO&Mの実態調査

c) O&Mの組織化、強化への助言・指導及びスタッフの訓練

d) 資源開発、水管理技術の助言・指導

2年次(1993年4月～1994年3月)

1. 1年次アニュアルレポートの作成

2. 1年次からの継続調査

3. 必要であれば、応急対策工事を行う

4. 必要であれば、ガイドライン案の修正を行う

5. 第2回ワークショップの開催

FAP13-II-Aと共同開催し、問題点の検討、情報の交換を行う

6. 2年次アニュアルレポートの作成

7. 中間検討報告書(Mid-Term Review Report)の作成

3年次(1994年4月～1995年3月)

1. 前年度からの継続調査

2. 中間検討報告書(Mid-Term Review Report)により新たに必要となった事項の調査

3. 第3回ワークショップの開催

FAP13-II-Aと共同開催し、問題点の検討、情報の交換を行う

4. 3年次アニュアルレポートの作成

4年次(1995年4月～1996年3月)

1. 前年度からの継続調査

2. ドラフトファイナルレポートの作成

3. 第4回ワークショップの開催

- a) FAP13-II-Aと共同開催し、問題点の検討、情報の交換を行う
- b) ドラフトファイナルレポート及びドラフトオーバーロールO&Mマニュアルの作成

4. オーバーロールO&Mマニュアルの作成

FAP13-II-Aと共同で行う。

5. ファイナルレポートの完成

3. O&Mテストプロジェクトの選定

3-1 プロジェクトの選定基準

FAP13 Phase I 調査のTeam Leader Dr. Paul Tompson が提示した Working Paper(資料-7) 及び同氏からの意見(資料-9)を参考にして、調査団は、次の選定基準を作成した。

- ① 対象地域が 1,000～5,000haのものが望ましいが、大地区の一部(sub-di-vision)を特定して調査対象とすることも考えられる。
- ② F A PのRegional Study別に、すなわち、FAP2(NW)、FAP3(NC)、FAP4(SW)、FAP6(NB)、FAP7(CBP)からこれらの地域を代表する地区を一つずつ選ぶ。
- ③ S R Pと協議して、彼らのショートリストから、S R Pの活動にも、FAP13-II-Bの活動にも、役に立つ地区を1～2地区入れると協調体制が整う。
- ④ L G E Bで管理している比較的小面積の地区を1～2選ぶ。
- ⑤ Narayanganj-Narshingdi Project (日本の援助によるFCD/I) 4,800ha(A-1地区 3,500haと Demonstration Unit 1,300ha)を入れる。
- ⑥ FAP12/13Phase Iで調査した17地区から選定すると資料が整っているのでFAP13-II-Aと協議して決める。
- ⑦ プロジェクトの特性(F C D、F C D/I……等)を考慮する。
- ⑧ 以上の中で、直接受益者以外の地域住民(漁夫、船頭等)への影響の多少や、受益者及び婦人層がプロジェクトに関与している地区と、してない地区を選定する。
- ⑨ 本事前調査団は10プロジェクト位を目標として選定する。

3-2 ショートリストの作成

3-1のプロジェクト選定基準に準拠し、FAP13のフェーズIファイナルレポート(march, 1992)及びイギリスODAが提示したDraft Working Paper (Operation and Maintenance Treatment and Priorities in Fap July, 1992)を参考にしてFAP地域別にしたプロジェクト・ショートリストは次の通りである。(図-1、選定候補プロジェクトの位置図参照)

FAP 2 (NW) 地域

NW region はBrahmaputra, Teesta, Darla及び Dudhkumar河からの表流水を利用したかんがい開発、また深井戸による地下水かんがいのポテンシャルが高く、不透水性土壌に栽培されるHYV Boro, Amanや透水性土壌に栽培される乾期作(例、小麦)のかんがい用水に利用されている。しかし、Brahmaputra-Jamuna河に沿った地帯の洪水調節は、低平地の栽培作物、北部、中央部の Aus、ジュート、移植Amanや南部の深水Amanの安定栽培に重要である。Ganges河沿いについても同様である。このような大規模堤防で保護された地帯での改良された水管理からの最大の便益を生み出す必要がある。

(1) Kamarjani Reach (FCD)

FAP 2の1992/Working Paper No.7で述べられているように、Brahmaputra右岸堤防(BRE)は入植者による堤防の使用等による堤防の浸蝕、崩壊を防止するため、その補繕が急がれている。

Kamarjani Reach (BRE)はFAP 12でRRAによりスタディが行われた地区であり、約10,000haある。

(資料-7、ODA Working Paper 2-2-3 とFAP 12 Final Report を参照。)

(2) Kumarnai Bund 地区とKurigram South地区(FCD)

1991年10月のFAP 2のインテリム・リポートで、Gaibandha地帯がプライオリティ地区とされた。

Kumarnai Bund プロジェクトとKurigram SouthプロジェクトはGaibandha 64,000haの南に位置し、プライオリティ地域の幅広い計画に適合し、その地域住民参加による水管理O&M実証地区として適している。

(資料-7、ODA Working Paper 2-2-3 参照。)

FAP 3 (NC) 地域

NC Region、特に南部と中央部は、雨期作の作物生産改良のために洪水防御が必要とされている。洪水調節によって、Aus、深水Aman、ジュート栽培が安定し、施肥効果や改良種の導入が可能となる。また、NW地域と同様に、Brahmaputra河やその支流からの表流水によるかんがい開発、特に北部地域では地下水による、HYV BoroやAmanの補水かんがい開発のポテンシャルが高い。

(3) Katakhalī Khal Project(FCD) とSreenagar-Mawa-Bhaghyakul Project(FCD/I)

FAP 12/13 Evaluation Projectの一つ Katakhalī Khal Project (3,000ha)はJamalpur Priority Projectの北に位置する。これは現行管理下のモニタリング作業に対する有効な

O & M実証地となり得る。

(資料- 7、ODA Working Paper 2-3-2 参照。)

Sreenagar-Mawa-Bhaghyakul (FCD/I) は1992年6月に完成し、受益面積 4,200haで、完成直後であることから、現在O & Mスタディが望まれている。

FAP 4 (SW) 地域

SW Regionは地域内の湛水を排除する排水改良と南部海岸地域での塩水侵入を堤防樋門で調節することが必要である。

特にGanges河からの表流水かんがい開発のポテンシャルが高く、また同時に、乾期に塩水被害を受けている工場地帯への良質な工業用水の補給を保證することができる。

(4) Kolabashukali Project (FCD)

FAP12 でP I E調査の対象地区となった受益面積はJessore Districtと Khulna Districtにかけて約20,000haである。I D A援助でBWDBの管理外として1975年着工し、1983年に完了した。

SW地域北部の代表的な“Beel開発”でのO & M実証地区の一つとして取り上げられる。

(FAP12 Final Report, PIB Case Study Report 参照)

(5) Khulna South Polder (FCD)

Khulna District から Satkhira Districtにかけて分布する地区の Polder Managementも1～2選定する。塩水・潮位の影響とO & Mに関連して、北部と異なった特性を持っている。

FAP 5 (SE) 地域

多くの主要なFCD/Iプロジェクトが実施され、特にChandpur Irrigation Project(FCD/I) 56,000ha、SRPのO & Mの重点地区となっている。FAP13-II-Bとしては、この地域を除く。

FAP 6 (NE) 地域

NE Regionは降雨量が非常に多く、Sylhetの低平地の深い洪水、ゆるやかな河川勾配のために、水文学的に、開発が最も難しい地域である。Old Brahmaputra 氾濫原の西部は、NC地域と同様に Controlled floodingとSubmersible embankment建設及びその改良O & Mの手法の確立が必須となる。

(6) Submersible Embankment Project (FCD)

この地域におけるSubmersible Embankmentによる開発地区の改良O & Mを実証するため、地域を代表する、比較的新しく完成した 5,000～10,000ha程度の地区をFAP 6、SRP、

FAP 13-II-A、その他関係機関と打合せながら選定する。

FAP 7 (Coastal Embankment Project, Cyclone Protection Project)

インド東部国境からKhulna、Faridpur、Barisal、Noakhali及びChittagong districtに至る海岸地帯、延べ 150万haの輪中開発プロジェクトで、干拓堤防により囲まれた 108もの輪中 (Polder) 開発である。干拓地の大きさは 5,000~30,000ha。1960年に開始し、1980年に完了した (援助はUSAID)。

1991年4月のサイクロンによるChittagong地域の防潮堤防の被害の緊急復旧と全地区の二次開発計画が実施されている (ODA Working Paper P.P.2-11~2-14参照)。

⑦ Coastal Embankment Project (FCDとCyclone Protection)

Khulna DistrictからCox's BazarにかけてのPolderプロジェクトの中からSRP、FAP 7、FAP 13-II-A、その他関係機関と協議しながら1~2のプロジェクトを取り上げる。

System Rehabilitation Project (SRP)

SRPは全国にまたがる。IBRD、EEC、オランダ政府、WFPによって支援され、対象面積60万ha、プロジェクト数約80からなり、改良かんがい施設の修復、水管理、末端水路網整備開発、日常的維持管理のコストの見直し、受益者参加などで構成されている。1990/1991に開始し、7年計画で実施されている。

(8) SRP Projects

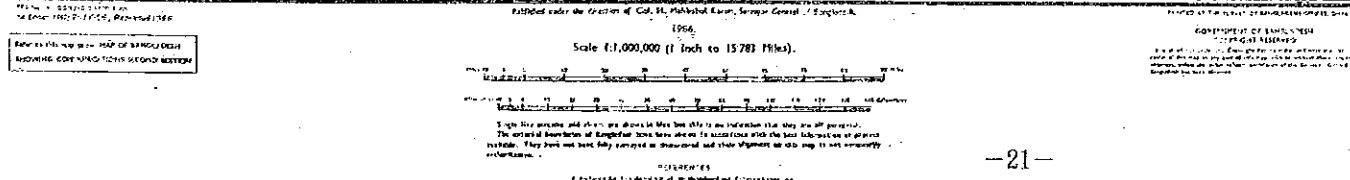
SRP地区 (候補地を含む) からO&M実証対象プロジェクトとして、タイプ別、地域別に2箇所程度選定することが望ましい。

SRPのプロジェクト数は80にも渡っており、まだ事業を実施していないものもあることから、BWDB (SRP)、FAP 13-II-A、その他関係機関と協議して選ぶ。

日本の援助によるプロジェクト

(9) Narayanganj-Narshindi Irrigation Project (FCD/I)

ダッカから東へ20km、Sitalakhya河岸に位置し、平均5~6mの低平地である。デモンストラーション・ユニット 1,300haは1984年に完了し、ブロック A-1 3,500haは、1993年に完了する。本地区は洪水防御、排水改良、ポンプかんがい施設を完備したプロジェクトであり、FCD/Iの改良O&M実証地区として適している。



4. 結論及び提言

1. 総括

(1) FAP全般の進捗について(1992年6月末現在)

Progress Report, Quarterly, June, 1992によると、11 plan components と15 supporting activities (計26 FAPs)のうち、FAP 11とFAP 26を除き、全てのTOR、TAPPは認可され、若干の遅れはあるものの、順調に進捗していると考えられる。コンサルタンツの張り付けは、全FAPsについてすでに完了している。

現在までにFinal Reportを提出したのは3つのFAPで、FAP 8A Dhaka, Integrated Protection (Japan), FAP 12 FCD/I Agricultural Review (UK/Japan) 及びFAP 13 O&M Study Phase I (UK/Japan)である。FAP 15 Land Acquisition and Resettlements (Sweden), FAP 23 Flood Response Study (USA)が、Final Report提出の段階にある。

FAPsの中で建設工事に着手しているのは、FAP 7 Cyclone Protection(SFD, Japan, IDA)とFAP 8B Dhaka Integrated Flood Protection (ADB)で、IDAはFAP 1 BRBとFAP 9B Meghna Protectionを、またADBはFAP 9A Six Secondary Town Protectionの建設を考慮中である。

FAPのこの2年間の動きの中で、洪水対策のアプローチに有為な変化がみられる。すなわち、FAP発足当時の洪水軽減(flood mitigation)中心の考え方から、統合水管理(integrated water management)へと志向しており、洪水(氾濫)現象のプラス面を、有機的に採り入れた“controlled folding and compartmentalization”の考え方へと誘導されつつある。(巻頭の用語説明参照)

(2) イギリス(ODA)、バングラデシュ政府(特にBWDB)と日本チームとの関係について

FPCOから配布された1992年8月2日のFAP 13-II-BのTORに関する会議のworking papers(別添資料-6)は、FAP 13-II-AとBについて、現在までの三者の合意事項を整理したもので、その3ページ、5)にはBWDBがFAP 13-II-B調査のバングラデシュ側の主実施機関となることが明記されている。そこで、13-II-Bチームのcounterparts、その他の折衝は、まずBWDB本部を通じて行うこととなろう。当然のことながら、FAP 13-II-Aチーム及びFPCOとの密接な連絡は不可欠のことである。

特に、BWDBは、現在18,000人(長官から水門番まで入れて)を擁する巨大な機構で、そのうち11,000人がO&M業務に携わっており、全国に配置されている。この機構の有機的な活用が図らなければならない。更に、BWDBは、我が国の水資源開発公団に相当する技術者集団であるから、FAP 13-II-Bチームのプロジェクト・リーダーは技術者の方が、FPCO(幹部はほとんどがBWDBの出身、または、出向者である)やBWDBとの折衝が、円滑にゆくとされる。また、今までのFAP 12とFAP 13-Iは、どちらかといえば、調査の性質からバングラデシュ国の現行水行政を、批判する立場を採らざるを得なかったが、今回のFAP13-II-Bチームリーダーは、FAP13-II-Aチームリーダーとバングラデシュ側との緩衝剂的役割を果たす立場に

立つと思われる。

(3) 実証地区の選定について

1992年8月4日、O & M実証地区の選定についてMr. M. A. Rashid (Chief Engineer, System Rehabilitation Project, BWDB) と会議をもった。BWDB本部からMr. Rafib Zaman (Director, Planning)、SRPのオランダコンサルタントMr. Leen van't Leader (Team Leader) が同席した。

SRPは1990/91年から7ヵ年計画で、IDA、EC、GON (Government of Netherlands)、WFP (World Food Programme) 資金と、バングラデシュ内資で実施されている。その内容は、①60万haをカバーする約80のプロジェクトの復旧、改良、維持、②Chandpur (CIP), Muhuri (MIP), Karnaphuli (KIP) の3主要灌漑地区 (計10万ha) の改良維持管理 (IOM: Improved operation and maintenance) の導入、③17,000haをカバーする2地区におけるon-farm development (OFD) の実施、④BWDBスタッフとこれらの地区の受益者のO & Mについてのトレーニング、⑤選定された10地区のbenchmark and evaluation studies、⑥その他O & Mに関するソフト面、たとえば、行政/財政アドバイザーの派遣、ハード面全般にわたる技術協力等である。SRPに参加している5機関は、それぞれの分野と、期間で分担しあっている。

詳しくはFAP13-I, Final Report, 第4章Projects to Improve O&M in BWDBを参照、また資料-7: Draft working paperの第3章にこのFinal Reportの補足がある。

この事前調査団の目的を、SRPの同席者に説明したところ、彼らは、上述のようなSRPが現在実施している作業内容を説明して、SRPとFAP13-II-Bの調査内容が重複していることを指摘し会議が混乱した。同席したBWDBのPlanning Directorが、彼らにFAPの性格と業務内容を要領よく説明し、政府機関、担当コンサルタントがよく連絡しあえば、決して重複はしないことを補足説明し、結局最後にはChief Engineer, SRPは、FAP13-II-BのテストO & Mパイロット地区選定に協力することを約束した。

SRPに関する基本資料として、Report No. 8093-BD, Document of the World Bank, Staff Appraisal Report, Bangladesh BWDB System Rehabilitation Project, Feb. 1990 及びそのAnnexesがある。

地区選定に関して入手した資料は、3章に述べたごとく、ODAコンサルタントのBridging periodのWorking Paper (資料-7)、これをベースにしたショートリスト (資料-9)、BWDBからの完了地区リスト (資料-8) 等である。最終的な地区の決定にあたっては、BWDB、LGEB、関係FAPs (FAP2, 3, 4, 6, 7, 15, 17, 20, 26等) との協議が必要である。FCD/I完了地区のO & Mに関してのBWDBとLGEBとの分担については、FAP13-Phase I Final Report, 2章4.1及び2章5.4を参照されたい。

特にわが国でもそうであるように、完了したFCD/I施設の維持管理及び復旧業務は、地

方機関が、また大規模地区については現地事務所が所掌しているので、正確な情報を得るためには、これらの機関と直接打合わせ、現地踏査をしてから決定する手順を踏まなければならない。

(4) 連絡車両の必要性

FAP13-II-AチームとBチーム、特にチームリーダーは常に連絡しあって行動する必要があるので事務所は同じ建物内に設置することが望ましい。また、両チームは他のFAPsとの連絡、会議、折衝を頻繁に行わなければならないし、調査の性格上、FPCO、BWDB本部、日本大使館（JICA事務所）、イギリス大使館（ODA事務所）との会議、他のFAPsが開催するワークショップ出席などのために、現地調査用の車両に加えて、1～2台余分の車両の配置が調査の性格上、必要であると思われる。

2. 施設維持管理

(1) 施設維持管理を考える上での基本的な問題

FCD/I施設の維持管理を考える上で日本における維持管理上の今日的な問題が参考になるとと思われる。

1) 一つめの問題は、FCD/I施設の維持管理における受益者意識の醸成の大切さである。

FAP13 Phase I 調査では、これまで実施してきたFCD/I事業の維持管理上の問題点の一つとして、一般的に計画、設計、建設、移管段階での住民協議が欠けていたことを指摘している。これは、日本における土地改良事業と異なりバングラデシュでの事業の多くが海外援助によって実施されていることから、受益者としての債務（土地改良事業に対する愛着や、日常の管理の重要性）と認識が薄いことに起因しているものと思量される。

2) 日本においても、最近の農業を取り巻く社会、経済情勢の急激な変化、農業内部における農家数の減少、兼業化の進行、農村地域の混住化の進展等の影響により農家意識の変化、集落機能の弱体化、農業水利秩序の混乱、従来集落機能に依存していた末端施設管理の粗放化をもたらし、その結果、ゴミの水路への投棄や水質の悪化が雑草、藻の過繁茂による通水障害をきたし、農業用・排水機能が阻害されており、受益者意識がいかに重要であるかを提起している。

こうした状況の中で土地改良区を中心とする管理団体では、管理業務が質、量ともに大きく変化しつつあり、維持管理問題への今後の対応としての、公的管理、公的助成の必要性が二つめの問題である。

3) 日本においては、これまで、土地改良施設の管理については受益者管理を原則として行ってきたが、①混住化、都市化の中で、水質保全や地域排水等地域の居住条件に対する土地改良施設の公共性・公益的役割が増大していること、②施設の高度化・大規模化に伴う管理の

技術能力、責任能力、調整能力の確保が必要となっていること、③兼業化の進展等に伴う土地改良区の弱体化が、土地改良施設の適切な管理に支障をきたすようになっていること、等に対応して公的管理、公的助成の必要性が生じている。このため、国、県の関与（国、県が管理主体となる施設の対象の拡大、費用についての国、県の助成）、市町村の関与（管理費の助成、地財措置）が拡大されている。バングラデシュにおいては、約2万人の人員を抱えた組織としてBWDBが存在しており、これが維持管理において有効に機能することが必要である。

(2) 施設維持管理を考える上での具体的な問題

- 1) 上述の日本における問題も踏まえ、FCD/I施設の維持管理を検討する上では維持管理に対する受益者参加と公的関与を念頭におく必要がある。

すなわち、管理組織、管理主体、管理費負担者がその地区でどのようなものになっているかを把握し、将来的に実効性のある安定した維持管理が行えるよう、こうした管理組織等に対応して現実性のあるO&Mガイドラインとする。

また、管理組織によっては英語で書かれたO&Mマニュアルは役に立たないことも FAP13 Phase I 調査において指摘されており、運用上の個々の具体的な問題も充分認識しておく必要がある。

- 2) 維持管理の実証調査に当たっては、うまく保全されていない施設を対象に将来の望ましいガイドラインを作成することとなる場合もあると考えられるが、この場合抜本的な改修ができない中で、農民組織等を活用して保全しながらの対応となることを考えておく必要がある。
- 3) O&Mの実証地区の堤防には、いろいろなタイプがあると考えられるが、堤防の保全を考える上で、堤防のタイプや利用形態が受益者意識等に密接に関係し、特徴のあるタイプについては、それに対応する形のO&Mガイドラインが必要となる。

3. 農業及び農村社会

FAP13 Phase I で作成されたガイドラインは、Regional Studyで具体的に検討すべき事項については網羅されているが、実際のO&Mをどのように行うかについては示されておらず、勧告及び指針では概略以下のように述べている（勧告及び指針の公衆参加の項目）。

- ① 公衆参加に対する理想的な単一の技法を発見するということはあり得ない。

FAP試験・優先事業において幅広い参加方法の試験を行うこと。

- ② FAP事業は農民と非農民の組織体制確立を促進する必要がある。それらは多用な形態を取り得る。

そこで、FAP13-II-Bでの実証調査では実際に選定されたパイロット地区における施設維持管

理に関連する農民組織化、住民参加の促進、関係者とのコミュニケーション強化等を図り、その過程において、NGOの活用や土地無し労働者、さらに事業によっては不利益を被った集団等への対策も含まれることとなるが、その技法は一律ではないことから、ソフト面での地元対応を軌道に乗せ、調査完了後スムーズに地元へ移管するには、調査の初期段階からバングラデシュ中央政府機関及び地方行政機関が本調査推進にかかわる体制を整備することが必要不可欠である。

また、地区の抱える維持管理上の問題点解決のために必要な対策項目を、対策実施によって改善されると想定できる成果の発現速度の視点から、短期、中期、長期対策に区分し実証対策実施計画を樹立することも大切である。

調査地区選定に当たっては、地区におけるNGO、LGEB、BRDB等による農民組織の結成、活動状況を考慮に入れることが望ましい。これは、本調査で実証しようとする事項を速やかに地元住民へ浸透させる上での情報伝達機関ともなる。特に、NGOは、実証調査段階で必要と判断された工事に、質の高い労働者の紹介を通じて土地無し労働者層へ利益をもたらすことにもなる。

FAP13 Phase Iでは、これまで実施してきたFCD/I事業の維持管理上の問題点の一つとして、一般的に計画、設計、建設、移管段階での公衆協議が欠けていたことが指摘されている。しかしこのことは、わが国における土地改良事業と異なりバングラデシュの事業の多くが海外援助によって実施されていることから、受益者としての責務（土地改良施設に対する愛着や、日常の管理の重要性）と認識の薄さにつながっていると思われる。

このようなことから、農業及び農村社会の分野における実証調査での課題として、受益者が事業で設置された施設の原理と機能を理解し、維持管理に当たって「自分達の施設」という愛着を抱き、施設の大切さを認識し、末端施設の日常管理を進んで分担するような体制を組織することが必要である。

4. 実証計画

- (1) FAP13-II-Bの作業計画（案）は、ODA側、FPCOと再三にわたり協議・検討を行い、8月12日にTOR 10th Draftに記載した。
- (2) 調査対象地区の選定に当たっては、イギリスODA事前調査団、FPCOと協議しながら3.3-1 プロジェクトの選定基準に沿って、10地区をリストアップした。これらの地区は、現在まで入手することができた資料とイギリスODA事前調査団との協議をベースに大枠として提起したものである。
- (3) 将来を展望した地域内の水質管理にかかわる提言及び水質維持に関する地域住民へのモラルの形成を含んだ維持管理ガイドラインの作成が望まれる。

- (4) 1958年以降1991年6月までにBWDBが建設したプロジェクト数は452箇所に入る。個々のプロジェクトの農民組織、住民参加、貧困女性の活用・土地無し農民の参加、NGOの活動、水管理の実態、施設の維持管理状況などは、FPCO、BWDB本部、BRDB本部では入手することはできず、各プロジェクトの現地担当者レベルでまで行かないと実態は把握できない。
- (5) FAP13-II-Bの実施方法は、選定されたパイロット地区を取り巻く諸条件によって、それぞれ異なると思われるが、基本的なアプローチの方法と考えられる事項を希望を含めて次のように提言する。
- ① 調査実施の早い段階で、パイロット地区にかかわる地元関係行政機関レベルでの調査推進体制を確立するとともに、維持管理改善組織を設立する。
 - ② パイロット地区事業及び適正な維持管理によって発生した（または発生する）効用（負の要素も含む）を把握し、その効用が帰属する集団を特定する。このことによって、不利益を得た者への対策及び利益者の責任を明確にすることができ、受益者の認識高揚のための説明資料として活用できる。
 - ③ 事業の仕組みや施設の原理、機能、必要な維持管理方法、洪水などの緊急時の対応等についての地元住民への説明は、写真スライド、オーバーヘッドプロジェクター等を利用し、住民が分かり易く、また興味を引く方法で実施すること。バングラデシュ国の非識字率が66%（UNESCO統計年間バングラデシュ国の1985年）であることからしても、いくら立派な印刷物を作っても、一般住民の理解を得るのは困難であると思われることからである。ベンガル語版16mm映画を作成できればなおよいと思われる。

5. 関連資料／会議議事録／その他

(資料-1)

MINUTES OF MEETING
BETWEEN OVERSEAS DEVELOPMENT ADMINISTRATION
AND JAPAN INTERNATIONAL COOPERATION AGENCY
ON THE TECHNICAL COOPERATION
FOR FLOOD ACTION PLAN STUDY NO.13 PHASE II. IN BANGLADESH
OPERATION AND MAINTENANCE STUDY

1. INTRODUCTION

- 1.1 Following the drawing up of the Bangladesh Flood Action Plan (FAP) by the Government of Bangladesh with the assistance of the International Bank of Reconstruction and Development, the Government of the United Kingdom, through the Overseas Development Administration (ODA) and the Government of Japan through the Japan International Cooperation Agency (JICA) have agreed to cooperate to undertake the FAP items No.13 (Operation and Maintenance Study) Phase II.
- 1.2 This document defines the terms and the conditions for the execution of the study to be undertaken by ODA and JICA, and is designed to facilitate smooth conduct of the study and to be utilized when any matter arises between the two parties.

2. ORGANIZATION AND TERMS OF REFERENCE FOR THE STUDY

- 2.1 The scope and schedule of work for the study will be as set out in the Terms of Reference for Action Plan No.13 Phase II to be approved by the Technical Committee of the Government of Bangladesh. The staffing and other inputs required for the execution of the study and documents to be concluded are outlined here.
- 2.2 The study will be implemented as two separate components such as FAP 13 Phase II-A and Phase II-B, being conducted by ODA and JICA, respectively, in conjunction with local consultants from Bangladesh.
- 2.3 In order to formalize the participation of JICA and ODA in the study, three different sets of documents will be signed:
 - (1) Minutes of meeting between ODA and JICA (this document).
 - (2) Scope of work between the Government of Bangladesh and JICA (to be negotiated).
 - (3) Bilateral agreement between the Government of Bangladesh and ODA (to be negotiated).

3. RESPONSIBILITIES OF THE PARTIES

3.1. Offshore Inputs

Offshore inputs for project year 3 and 4 will be confirmed following review in the second project year.

Handwritten signatures:  

3.1.1. Responsibilities of ODA

ODA will finance the following experts (including their living allowances and air fares):

- Tentative
- Institutions Specialist/
Team Leader
- O&M Engineer
- Economist/ O&M Specialist
- Short-term Consultants
- Project Director

3.1.2. Responsibilities of JICA

JICA will finance the following experts (including their living allowances and air fares):

- Tentative
- Team Leader/Senior Engineer
- Institution Specialist
- Agronomist/Extension Specialist
- Short-term Consultants
- Senior Specialist

3.2. Local Inputs

3.2.1. Responsibilities of ODA

ODA will finance the following inputs for FAP13-II-A:

- Local consultants
- offices facilities including equipment
- Computers for British experts
- Report production
- Transportation
- Administrative staff
- Other expenses

3.2.2. Responsibilities of JICA

JICA will finance the following inputs for FAP13-II-B:

- Local consultants
- Offices facilities including equipment
- Computers for Japanese experts
- Report production
- Transportation
- Administrative staff
- Other expenses

Handwritten signatures:
Pudak WMM

- 3.3. ODA and JICA will recruit their experts independently. The experts are to be present in Bangladesh in accordance with scheduled timetables for the study.
- 3.4. ODA and JICA will provide the team leader for 13-II-A and 13-II-B, respectively.
- 3.5. The final reports should be submitted by March 20th, 1996.

4. CONSULTATION MECHANISMS

- 4.1 ODA and JICA will keep contact each other closely prior to the commencement of the study, which is scheduled for November, 1992 or as soon as possible thereafter.
- 4.2 Once the study is underway ODA and JICA will review the study annually and will consult each other before recommending any changes to the scope of the studies.
- 4.3 ODA and JICA will carry out the studies, both independently and jointly.
- 4.4 Initially the contact person for ODA will be Peter W. D. H. Roberts, Senior Engineering Adviser, the South Asia Development Division (SEADD) in Bangkok. Subsequently, ODA will transfer responsibility to new aid management office in Dhaka.
- 4.5 The contact person for JICA will be Hiromi Motomura, Agricultural Development Study Division, JICA in Tokyo.

Dhaka, 5th, August, 1992



Peter W. D. H. Roberts
Senior Engineering
Adviser, SEADD, ODA
Bangkok



Masahito Uwagawa
Leader of
Preparatory Study Team
JICA

(資料-2)

Meeting at British Embassy in Bangkok

The meeting was held at the British Embassy in Bangkok on 30 August 1992 from 9:00 A.M. to 10:00 A.M.

Attendants:

Mr. Peter W.D.H. Roberts, senior Engineering Adviser, SEADD, ODA, Bangkok

Mr. John Hoy, Economic Adviser, SEADD, ODA, Bangkok

Japanese mission members

The followings are brief memos taken in the meeting from the British side.

1. The British ODA will open their office in Dhaka, Bangladesh by the end of 1992.
2. UNDP recently carried out the overall study on FAP.
3. Mr John Hoy visited Dhaka last week and met Mr Huda of FPCO.
Mr Huda of FPCO told Mr Hoy that:
 - (1) The picture and key role of FAP 13 phase II are rather unclear.
 - (2) More study may be needed before launching the programme.
 - (3) Water board may also be responsible for the project.
4. Important thing is how to link the existing Bangladesh institutions with our components.
5. The Water Board people (the Bangladesh Government side) do not wish to have any more consulting services on FAP 13 phase II, but want actual work (construction work).
6. The pilot project must be worked together with the Bangladesh institutions.
7. Better concentrate on the existing project together with Water Board.
8. British ODA wants to know total figure of the amount of T.A. of FAP 13 B.
9. Mr. Peter Roberts will visit Dhaka on August 2, 92 (possibly in the evening) and join the meetings with us.
10. The minutes of meeting with both donor's sides will be signed on August 5, 1992 in Dhaka,
11. We better rely on Water Board more.
12. Mr. Thompson, Project team leader of FAP 13-I, is now in Dhaka for Bridge project to FAP 13-II-A, will be a right person to consult with when selecting the pilot projects.

13. Mr. John Hoy asked us when JICA will be able to commence FAP 13-II-B study work. We replied possibly November, 1992. He said that they wish to also start 13-II-A from November 1992, but may not be possible. December 92 will be possible and January 1993 will be more realistic,
14. The Bangladesh side must agree with the above (13).
15. 13-II-A and 13-II-B are not necessary to start at the same time, but better be closest possible.
16. Mr. Hoy would like to know if the Japanese government has already allocated the budget for the construction of FAP 13-II-B pilot projects along with T.A. Services. Dr. Uwagawa and Mr. Motomura answered that the Japanese Government has ready to provide the budget for urgent minor repairs, but can not present. the amount until the test pilot projects have been decided and needs the minor repair work.

(資料-3)

Meeting
at British High Commission, Dhaka

The meeting was held at the British Embassy in Dhaka on August 2, 1992 from 11:00 to 12 noon.

Attendants:

Dr. Harry L. Potter, Naturalist, First Secretary, British Embassy in Dhaka.
Mr. T. Ito, 2nd Secretary, Japanese Embassy in Dhaka.
Mr. T. Naruse, JICA Office in Dhaka
Dr. M. Uwagawa, Prof., Komazawa University
Mr. H. Yoneda, Ministry of Agriculture, Forestry & Fishery
Mr. D. Kusano, Ministry of Agriculture, Forestry & Fishery
Mr. H. Motomura, JICA HQR
Mr. H.N. Arai, CPC
Mr. Y. Osato, CPC

Dr. Potter arrived in Dhaka about 6 weeks ago and took miss Linda Brown's positions.

Miss Brown was in Charge of FAP 13 Phase I Programme.

Briefs of the Meeting

Potter : Is this FAP 13 Phase-II-B going parallel or separate with FAP 13 phase-II-A.

Leader : Will go parallel

Potter : For the next 3 months, seven experts of ODA will move in Dhaka. They are an engineer, education specialist, agronomist, anthropologist, fishery specialist, etc. Right now SEADD (South East Asia Development Development Division) is controlling Dhaka, but the power will be gradually shifting to Dhaka ODA office.

Leader : When will Mr Roberts come in Dhaka ?

Potter : He will be arriving in Dhaka this evening from Bangkok.

Potter : O&M cell will be created. It is extremely difficult, but it is a necessary "Evil". It's important and crucial, Bangladesh Government has accepted the idea. But the Government is somehow reluctant to create a new body since they have enough man power, but O&M issue is quite different from others and they are pushing it aside.

The idea of "Cell" actually came from consultants. Water Board will be responsible for the O&M, I am not sure where flood water should go. I worry about it. There are specific problems in each area so that the problems must be adjusted by overall FAP projects. This must be done by Water Board. However, water Board needs inputs from us. By now nobody told us what is really needed.

Today's meeting is just initial meeting and details will be discussed with Mr Roberts tomorrow. Mr Roberts wishes to hand over all the charges to me, but it will take time. Bangladesh Government wants more actual constructions, so we must make some balance. Bangladesh side requires formality and makes family tight between their institutions.

Naruse : Must confirm with the Bangladesh Government the necessity and importance of FAP13 Phase II,

Leader : Currently over 20,000 people are working under Water Board and a half of them are working for O&M. Effective use of O&M staff in the BWDB should be essential.

(資料-4)

THE BRIEFS OF THE MEETING AT FPCO
(Aug, 2, 1992)

The meeting commenced at 12.30 p.m. and ended at 2:00 p.m.

Attendants:

Mr. M.H. Siddiqui, Chief Engineer, FPCO
Dr. Harry L. Potter, First Secretary, British High Commission
Dr. Paul Thompson, Acting Team Leader, FAP 13-II-A
Mr. T. Ito, 2nd Secretary, Embassy of Japan
Mr. T. Naruse, JICA Bangladesh Office
Dr. M. Uwagawa, Professor, Komazawa University
Mr. H. Yoneda, Ministry of Agriculture, Forestry & Fishery
Mr. D. Kusano, Ministry of Agriculture, Forestry & Fishery
Mr. H. Motomura, JICA HQR
Mr. H.N. Arai, CPC
Mr. Y. Osato, CPC
Mr. M.N. Huda, FPCO/POB
Dr. A. Nishat, POE/Bangladesh University Engineering Technology
Dr. Abdul Hannan, FPCO/POB
Mr. Md. Habibur Rahman, SE/FPCO
Mr. Syed Waliullah, POE (Sociologist)
Mr. Mujibul Haque, POE (Agronomist)
Mr. Sam Rafiquzzaman, Director, Planning Dept, of BWDB
Mr. Siddiqur Rahman, AE/EPCO

—Mr. Siddiqui, Chairman, welcomed the participants and requested to start the discussion.

—Mr. Huda stated that several key items, like as work schedule, were missing in the 2nd draft of tentative FAP13B

Also, he emphasized that O&M for compartmentalization project is definitely needed. This is a tool to control flood and now needs some adjustment.

—Dr. Uwagawa : our contact mission has been sent here to finalize TOR for FAP13-II-B talking with ODA and FPCO.

—Mr. Thompson : controlling flood and drainage are to be key concept of FAP and replanning of the identification of the project may be needed.

—Mr. Huda recommended 15 conflict areas for FAP 13A.

- Dr. Potter said that there are three types of projects : (1) Those which have ended,
(2) Those which are ongoing and (3) Those in planning.
- Mr. Huda : 13A is the source of guidance. The completed work will be taken into 13B.
- Chairman : Selection must be done in collaboration with Water Board.
- Dr. Potter : 13A and 13B must work together. There are two aspects in the study :
Engineering and institutional. Work can be adjusted day by day.
- Chairman : There are many good - size-projects for 13B, possibly 100 of them.
- Mr. Huda : 13A & 13B are parallel organizations and need to have closest contact and linkage.
- Mr. Rafiquzzaman : 17 projects have been studied at BWDB planning Department. 13B can pick up some of them on trial basis.
- Mr. Huda : 13-II-B study must include both institutional and structural parts. 13 I has already identified the problems and solutions. 13-II-A is to be "global" and 13-II-B is to be "local".
- Mr. Huda : Some word of "implementation" is needed to include in the work schedule and TOR of 13B.
- Dr. Uwagawa : In exextuting FAP13-II-B activity, it some minor urgent repairs are needed, Japanese government has ready to provide the budget for.
- Chairma : The final recommendation and Manual must be tranblated in Bengali.

(資料-5)

THE BRIEFS OF THE MEETING AT FPCO ON 12 AUGUST 1993

List of Participants attended in Meeting held on 12 August '92 in FPCO's Conference Room in connection with FAP-13-Phase-II.

Attendants :

Mr. S.A.M. Rafiquzzaman Director	Planning (Gen)	BWDB
Mr. Y. Osato	C.P.C. (JICA)	
Mr. H.N. Arai	C.P.C. (JICA)	
Dr. H.L. Potter First Secretary	B.H.C. (ODA)	
Mr. M.N. Huda	POE FPCO	
Mr. Abdul Hannan	POE FPCO	
Mr. Syed Waliullah	POE FPCO	
Mr. Habibur Rahman	SE/FPCO	
Mr. Mujibul Huq	FPCO	
Mr. Siddiqur Rahman	SDE FPCO	
Dr. A. Nishat	BUET/POE	
Mr. R. Wallam	FAP	
Mr. M.H. Siddiqui	FPCO/Chief Engineer	

Meetingは8月12日10時半より開催。

Mr. Huda & Mr. Habibur Rahman : FAP13-II-B Team の車輛の台数が少ない。車輛の割り当て先を明確にすることはできないか。

これに対し、日本側とODAは今の段階では車はFAP13-II-AとB共、4台と提示されており、配車先はプロジェクト開始時に決めることである旨回答。

Mr. S. A. M. Rafiquzzaman : FAP13-II-BはSRP (System Rehabilitation Project)を選ぶべきではない。現在このプロジェクトではO & M Studyをやっており、同じことの繰り返しになる。
できればCompartmentalizationのプロジェクトを一つ選んで欲しい。

Dr. Harry Potter : On Page 4 の4.3.1の中のAnnex Aは Dr. Thompsonが近々にProvideする。

この後、Minor CorrectionやMis-Spellingの訂正等を行った後、バングラデシュ大学のパネルメンバー Dr. A. Nishatが以下の点について所見を述べた。

- (1) FAP13-II-Bは必要であるがFAP13-II-AはあまりにもAcademicすぎる。
- (2) Inception reportは必要ではない。
- (3) 選ばれるプロジェクトは、On-goingのものか全く新しいものに絞るべきである。同じものを繰り返すべきではない。

これに対して、Dr. Potter、Mr. M. H. Siddiqui、Mr. M. N. Huda (POE, FPCO)が反論し、その必要性をそれぞれを述べた。Meeteingは12時半に閉会した。

閉会に当たり、Mr. Siddiquiは、今週中にFPCOのPannel Memberのみにより、10th Draftを検討する。そして、その結果を盛り込んだFinal TORをDr. Potterが作成して、日本側と協議することとした。

(資料-6)

Working Papers for the Meeting to be held on
2.8.92 for FAP-13 O&M Study Phase-II.

The FAP-13 O&M Study Phase-I has been completed. The consultant has identified the following areas for improvement of O&M and proposed for a phase-II Study.

- a) Institutional frame work
- b) Public Participation
- c) Planning and design for improved O&M
- d) The Transition from implementation to O&M
- e) O&M manuals
- f) Water management
- g) Maintenance
- h) Resource mobilization
- i) Infrastructure use and resource mobilization
- j) O&M Costs and Resource Estimates
- k) Training

The consultant has proposed that FAP-13, Phase-II should be carried out with the following objectives.

- identify and formulate promising new O&M initiatives and collaborate with the other FAP and non-FAP projects in testing these;
- monitor and evaluate innovative O&M initiatives being undertaken by other FAP and non-FAP projects;
- recommend more effective operation and maintenance (O&M) procedures and promote their adoption into new and existing FCD/I Projects;
- ensure that all those involved in O&M of FCD/I projects are aware on the progress of new initiatives that relate to their own efforts.

The above findings were discussed in FPCO with the two Donor Representatives UK/ODA and Japan. The original TOR of FAP-13 indicated that after completion of Phase-I, few short term consultants will visit Bangladesh and will monitor the implementation of the O&M recommendations. During discussions with the consultant, Panel of Experts, FPCO and others it came out that this short term visits would not be meaningful towards achieving O&M approaches and guidance. After intensive discussions amongst the Donors and FPCO a new TOR of Phase II was prepared in by the British High Commission which was reviewed and discussed in a meeting on May, 7. 1992 and the following points were agreed upon. The phase II of the project will be implemented as two separate sub-components sharing the same overall objective. These are identified as FAP-13A and 13B.

- 1) FAP-13A O&M Study Phase-II will collaborate closely with other FAP and non-FAP projects in the design and review of O&M activities, ensure that new initiative are complementary, rather than have efforts duplicated and provide feedback to all projects involved in improving O&M and the Water Sector in general on the merits and demerits of different alternatives. This is to be executed by UK/ODA.

FAP-13B - O&M study Phase-II, It would attempt the practical implementation of improved O&M procedure on a pilot basis and verify their applicability. This is to be executed by Japan/JICA.

- 2) The TOR and TAPP for FAP-13: O&M Study Phase-II (13A and 13B) need to be approved by T.C. and ODA and JICA would submit the cost estimate and detailed workplan of their respective components by 3rd week of May, 1992. In order to do this JICA Mission may take necessary action and propose for a Contact Mission.
- 3) To work in bridging period, ODA and JICA would prepare a detail workplan, man-month, cost etc. and would propose to ERD with copy to the Ministry of Irrigation, Water Development and Flood Control and FPCO.
- 4) There could be provision in TOR for an O&M cell attached to FPCO. The final decision of its location will be decided in the T.C. meeting.
- 5) Pilot Project Study under FAP-13B component was agreed to but the selection should not be limited only to projects completed under JICA assistance.

According to that decision the British high Commission, Dhaka send to FPCO on 27th May '92 cost estimate and man-month etc. of their portion i.e. FAP-13A, Phase-II along with the proposal of costing for the bridging period from March - August '92 to be continued by the Existing Consultant M/S Huntings Technical Services to collect additional data etc. for Phase-II activities.

The JAPAN Govt. could not supply the cost estimate etc. and detailed of their activities without a visit of the Contact Mission which is now visiting Bangladesh. This Mission is to place in the meeting the TOR, cost etc. for their activities. Decisions is to be taken :

- 1) The Phase-II of FAP-13: O&M Study would be conducted as per TOR-(To be approved) and under two sub-components as
FAP-13A - to be executed under UK/ODA grant
and FAP-13B - to be executed under Japan T.A. grant

- 2) Both UK and Japan Govts would provide necessary fund for the studies and works of the two sub-components of FAP-13 Phase-II.
- 3) If required both Govts will be formally requested by GOB for grant fund.
- 4) The bridging period for data collection under UK/ODA will be done by M/S Hunting Technical Services out of the balance fund of the Phase-I study as proposed by British High Commission, Dhaka.
- 5) BWDB will be the main implementing agency and FPCO will monitor and co-ordinator all the activities.
- 6) The TOR and the TAPP will be consolidated by FPCO after the receipt of necessary data from Japan Mission and UK Mission and will place it to Technical Committee for approval.

(資料 - 7)

Government of the People's Republic of Bangladesh

Flood Plan Coordination Organisation,
Ministry of Irrigation, Water Development and Flood Control

BANGLADESH FLOOD ACTION PLAN

FAP 13

OPERATION AND MAINTENANCE STUDY

DRAFT WORKING PAPER

**OPERATION AND MAINTENANCE
TREATMENT AND PRIORITIES IN FAP**

July 1992

Hunting Technical Services Limited

in association with:

**Flood Hazard Research Centre
Technoconsult International Limited**

under assignment to

UNITED KINGDOM OVERSEAS DEVELOPMENT ADMINISTRATION

OPERATION AND MAINTENANCE TREATMENT AND PRIORITIES IN FAP

SUMMARY

This working paper provides background information on treatment of O&M in FAP, the likely priority projects emerging from FAP and their O&M implications, and on the types of project where initiatives to improve O&M are already taking place within BWDB.

The various FAP studies indicate that the FCD/I investments which may emerge from FAP are most likely to be improvements to areas where there already is some form of flood protection infrastructure. However, instead of simple rehabilitation re-planning is involved based on a much better information base, more comprehensive assessment of impacts (both positive and negative), and local participation in planning. The objective of this process is for any investments to be sustainable, that is for there to be sufficient local benefits and for there to be institutional arrangements such that the projects can operate and be maintained for a long period without depending on external resources and yet still deliver services which benefit the inhabitants.

The following are prominent in the priority FCD projects being identified by FAP studies:

- main river embankments (retirements, strengthening), with implications for multiple use of the embankments (housing, trees etc.) and potential to target new benefits to the disadvantaged;
- bank protection involving both expensive hard points and low cost technologies, which may reduce maintenance needs in the face of erosion, but will in itself bring new maintenance problems;
- re-planning of exposed coastal embankments complete with afforestation of the foreshore to protect them and multiple use of embankments to accommodate those affected by embankment retirement;
- re-planning of FCD water management involving drainage improvements and controlled flooding, complete with integrated planning of linear infrastructure (roads, embankments etc) to create compartments;
- mitigatory measures to reduce adverse impacts, notably for fisheries and other ecological losses, but also to benefit those outside FCD projects (flood proofing, warning, access to FCD infrastructure), all with O&M implications;
- active public participation in planning, design, implementation and O&M;
- recovery of O&M costs from beneficiaries, at least at the outset in urban schemes, but ultimately in all FCD projects;

The initiatives within BWDB to improve O&M of FCD/I projects presently have a heavy emphasis on irrigation projects, although these often also provide flood protection. While the O&M methods and models developed will be directly relevant to FCD improvements under FAP, surface irrigation does not emerge as a high priority in FAP. There is, therefore, scope

for complementary pilot O&M work which would help to improve other project types and test ideas being developed under FAP (see above). Areas which might be addressed in pilot work include:

- maintenance and multiple use of main river embankments;
- maintenance and resource mobilisation in submersible embankment projects;
- social forestry and embankments - to reduce maintenance, generate funds and target benefits (subject of a working paper in preparation by FAP 13); and
- water management involving controlled flooding and fisheries mitigation.

Regionally the follow-up might involve some or all of (potential projects and relevant studies/projects, in addition to improved O&M under SRP which is important throughout, are noted in brackets):

- | | |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NW | <ul style="list-style-type: none"> - main river embankment maintenance and multiple use (BRE, FAPs 1, 2); - participatory O&M and monitoring (Gaibandha, FAP 2, SRP, EIP); |
| NC | <ul style="list-style-type: none"> - pilot drainage management (JPP, FAP 3.1); - main river embankment maintenance (JPP, FAP 3.1); - O&M monitoring and feedback (JPP, adjacent areas, FAP 20); |
| NE | <ul style="list-style-type: none"> - submersible embankment improved O&M plus resource mobilisation (with FAP 6); - O&M monitoring under existing management system (with FAP 6); |
| SW | <ul style="list-style-type: none"> - compartmentalisation and drainage improvement existing polders, plus fisheries development (FAP 4); - integrated 'semi-saline' polder management (DDP, FAP 4); - feedback from individual polder management initiatives (DDP, EIP, SRP, SSSFC DIP); |
| SE | <ul style="list-style-type: none"> - advice plus feedback into FAP planning from existing initiatives (SRP, LRP); |
| CPP | <ul style="list-style-type: none"> - advice and monitoring of afforestation and multiple use rehabilitation in coastal embankments (FAP 7). |

The learning process involving feedback into planning, design, rehabilitation and O&M is critical if lessons are to be incorporated into practice, and should also take account of relevant experience outside BWDB. This might involve expansion of monitoring and evaluation, and networking of information between different teams, projects and departments.

TABLE OF CONTENTS

Summary	i
Table of Contents	iii
1 CONTEXT	1-1
2 REVIEW OF FAP COMPONENTS AND IMPLICATIONS FOR O&M	2-1
2.1 FAP 1 Brahmaputra Right Embankment Strengthening	2-1
2.2 FAP 2 North-west Regional Study	2-2
2.3 FAP 3 North-central Regional Study	2-5
2.4 FAP 3.1 Jamalpur Priority Project Study	2-6
2.5 FAP 4 South-west Regional Study	2-7
2.6 FAP 5 South-east Regional Study	2-9
2.7 FAP 6 North-east Regional Study	2-10
2.8 FAP 7 Cyclone Protection Project II	2-11
2.9 FAP 9A Secondary Towns Integrated Flood Protection Project	2-14
2.10 FAP 20 Compartmentalisation Pilot Project	2-15
3 NON-FAP PROJECTS INVOLVED IN IMPROVED O&M	3-1
3.1 Introduction	3-1
3.2 System Rehabilitation Project	3-1
3.3 Second Small Scale Flood Control Drainage and Irrigation Project	3-2
3.5 Linkage between Existing O&M Improvements and Pilot O&M under FAP	3-3
REFERENCES	3-4

ABBREVIATIONS AND GLOSSARY

ADB	Asian Development Bank
BRDB	Bangladesh Rural Development Board
BRE	Brahmaputra Right Embankment
BWDB	Bangladesh Water Development Board
CEP	Coastal Embankment Project
DDP	Delta Development Project
EC	European Economic Community
EIP	Early Implementation Project(s)
FAP	Bangladesh Flood Action Plan
FCD	Flood Control and Drainage
FCDI	Flood Control Drainage and Irrigation
FCD/I	FCD (see above) with or without Irrigation
FFW	Food For Work
FOMS	Field Operations and Maintenance Specialist
FPCO	Flood Plan Coordination Organisation
ha	hectare
HTS	Hunting Technical Services Limited
JPP	Jamalpur Priority Project
LGEB	Local Government Engineering Bureau
LRP	Land Reclamation Project
M&E	Monitoring and Evaluation
MIWDFC	Ministry of Irrigation, Water Development and Flood Control
MPO	Master Plan Organisation
NGO	Non-governmental Organisation
O&M	Operation & Maintenance
PC	Project Committee
PPS	Prokalpa Porichalona Samity
RRA	Rapid Rural Appraisal
SRP	System Rehabilitation Project
SSSFCDIP	Second Small Scale Flood Control Drainage and Irrigation Project

2 REVIEW OF FAP COMPONENTS AND IMPLICATIONS FOR O&M

2.1 FAP 1 BRAHMAPUTRA RIGHT EMBANKMENT STRENGTHENING

2.1.1 Background

Erosion of the Brahmaputra Right Embankment (BRE) is a major problem. Retirement and maintenance of the embankment are also important issues. This study has undertaken extensive surveys and monitoring of the embankment's current condition and erosion threats, along with modelling of the river morphology. Operation is not such a key issue since operation of structures within the BRE is for water management in the areas behind the embankment; these fall within the remit of FAP 2 and do not appear to pose significantly different drainage and water management problems from those of other FCD projects. Two types of work are emerging from FAP 1 each with specific maintenance requirements:

1. Major revetment works at selected priority hard points involving high cost engineering works and which will involve international contractors and new techniques.
2. Embankment retirement using traditional construction methods in which the issues of use of the embankment, including settlement by people, are of particular importance.

There are presently no improved O&M initiatives in progress for the BRE.

2.1.2 Revetment O&M

This is a specialised area, and FAP 1 has prepared a draft report on the subject (BWDB, 1992 Brahmaputra Right Bank Priority Works - Provisions for Operation and Maintenance). Two priority areas have been identified: Sariakandi and Sirajganj. The proposals are currently (July 1992) being reviewed by a World Bank Appraisal Mission, and a plausible timescale is that work in Sariakandi might be completed by the 1995 monsoon, and Sirajganj a year later.

The critical component of the new works will be the use of geotextiles to retain the embankment material, with concrete blocks to hold down and protect the geotextile. As there are apparently no other bank protection works which use this technique in Bangladesh there are no other sites where performance might be monitored in advance. Moreover the monitoring and maintenance of such works is a highly specialised field requiring appropriate equipment (side-scanning sonar, heavy plant etc.) hence it is more appropriate that the implementation phase of these works include establishing monitoring and maintenance facilities and capabilities as proposed by FAP 1. While FAP 13.2 could include this experience in its annual workshop review it is not certain that there will be any experience to share with other FAPs concerning this type of maintenance before 1996.

It is notable, however, that the proposals build in detailed technical monitoring, and strengthening BWDB capability in this, as part of the maintenance programme, and that assistance in O&M and monitoring is proposed for the first two years after construction.

2.1.3 Embankment retirement and maintenance

A substantial length of the BRE is likely to be retired over the next few years. In implementing this FAP 1 has suggested that the BRE designs be revised to include a country-side raised berm of perhaps 4-5m width which would be used for settling squatters already living on the embankment, and could be used for those who will find themselves living outside the embankment or who lose their land to erosion. Additional suggestions are to use vegetation, vetiver grass and fruit trees for example, to create a livelihood from the embankment for settlers and hence an interest in maintaining it. All of these ideas are on the same lines as suggestions made in FAP 13 phase 1.

There does not appear to be any directly comparable work on such embankment use and maintenance outside FAP. Social forestry and routine maintenance experiments are on roads and some embankments away from the main rivers, and do not include programmes for settlement on the embankments (FAP 13 in its bridging period is investigating the scope for social forestry on embankments). Hence this might be an appropriate subject for pilot O&M work under FAP 13. For example taking a modest length of embankment, perhaps a newly retired section which is not expected to be threatened by erosion for several years. The pilot project would then develop an institutional mechanism for leasing out stretches of embankment to the landless, and experiment with productive uses of the embankment.

Alternatively the pilot work could start with retirement design which would give the new rather than old embankment cross-section to work with but would delay feedback on experience into the remaining works. In the latter case the FAP 13 follow up could work with the BRE retirement project in developing an appropriate design and settlement and planting programmes. If the FAP 1 BRE monitoring continues this might be sufficient to evaluate the impact of the experiments in physical terms, alternatively FAP 13 second phase could monitor a comparable reach of BRE without any innovations in maintenance and use to compare embankment use and maintenance standards with the pilot area.

2.2 FAP 2 NORTH-WEST REGIONAL STUDY

2.2.1 Background

The North-west region is relatively complex, comprising:

- the hinterlands of the Brahmaputra Right Embankment (covered by FAP 1), and of the other main embankment projects along the Teesta and Brahmaputra;
- the upper catchments of several minor rivers in the far north west (which are relatively high and less flood prone); and
- the lower Atrai basin and its confluence with the Bengali.

Since the Interim Report in October 1991 (FAP 2, 1991) the study has concentrated much of its effort on extensive surveys and public consultation in the Gaibandha priority project area. Given that Gaibandha has been identified as the priority area, this is probably the most appropriate focus area for O&M in the region.

Existing initiatives for improved FCD/I O&M in the region are limited to the following (see Chapter 3):

- SRP working in Nawabganj O&M Division - principally to improve drainage and water management, but including embankment maintenance. A relatively self-contained area not hydrologically linked with the key areas for FAP 2, but which should provide very relevant practical experience in improving FCD O&M for FAP;
- SRP working on the Buri Teesta Irrigation Project - principally for on-farm development in a surface irrigation system, hence of very limited direct relevance to FAP; and
- SSSFCDDIP's small pilot O&M project at Panchanala Koya Beel - primarily for supplementary irrigation, but the performance in local management and secondary experience in resource generation is likely to be of general relevance for improving O&M.

2.2.2 Treatment of O&M to date

In common with the other regional studies there has been little scope to include any detailed work on O&M in the initial planning and prioritisation stages. However, the Interim Report does make several important comments on O&M:

a) Costs

FAP 2 notes that O&M of river training and submersible embankments is likely to be higher than the general guidelines of 3-6% (FPCO, 1992), and uses 12% of capital costs for submersible embankment O&M. More importantly FAP 2 (1991) argues that in estimating O&M costs as a proportion of capital costs allowance must be made for rehabilitation, since many FAP projects would make use of, rehabilitate and improve on existing FCD infrastructure. Hence it is appropriate to base O&M cost estimates on both new construction costs and on the replacement value of existing FCD infrastructure which will continue to serve a purpose in the new project. This should be taken into account by other FAP studies when existing infrastructure is planned to be incorporated in a project.

b) Separating operation from maintenance

FAP 2 also points to the main issue in operation being conflicts of interest, and that since public cuts may arise when there are small differences in water level (.3m) that drainage improvements are a priority. So far as maintenance is concerned, it notes that a proper inventory of facilities plus monitoring is needed, plus resources, and that BWDB does not have legal powers to raise funds for FCD O&M at present. The suggestion is that local administration or other bodies with revenue raising powers become involved.

2.2.3 Gaibandha priority area

The priority area extends from the Teesta bridge along the Teesta right embankment to the northern part of the Brahmaputra right embankment as far as Gaibandha town. Hence this is a large area of some 64,100 ha which already lies within several FCD projects. The key issues are:

- providing protection from the Teesta since a large part of the embankment has been eroded leaving much of the study area open to flooding;
- flood protection along the Ghagot river (western boundary of the area) - this will partly be provided by the Saldamoa Khatla Beel project (EIP sub-project covering some 6200 ha) when completed, but further works would be necessary;
- the south end of the project which has had severe drainage problems and where the Manas regulator is likely to be lost shortly to erosion by the Brahmaputra; and
- internal drainage - there are problems of conflicts of interest and cuts of roads which obstruct drainage within the area, and potential to have compartments, but a risk of continued conflicts if the compartments have interlinked drainage.

Hence this area raises two of the main O&M issues in FAP: maintenance of major river embankments, and improved drainage and water management within protected areas.

It was suggested by FAP 2 that simple maintenance of main river embankments is not so much a problem as erosion, and that the work of FAP 21 on low cost bank stabilisation is likely to point the way towards reducing recurrent erosion protection costs which often eat up maintenance funds. Nevertheless there is potential to improve maintenance and a need to take into account use of the embankment by settlers which at present reduces the structural strength of the embankment (FAP 2, 1992 - Working Paper no 7), just as in other parts of the BRE. It should be noted that one of the BRE reaches which was evaluated by RRA under FAP 12 is within this area - the Kamarjani reach - which might form a basis for continued monitoring, or planning O&M work in the area, or a pilot main river embankment maintenance programme (Section 2.1.3). A pilot wide embankment within the area is being considered by FAP 2.

Improving internal water management will depend on the rate of implementation of works within the area, since at present there is no completed compartment within the project area. However, the Kumarnai Bund project which lies in the southern corner of the priority area is due for rehabilitation under SRP (although it does not appear to be in the first two rounds of sub-projects for feasibility studies (SRP EC funded component pers. comm.), and might form a suitable pilot area for O&M if it both fits into the wider plan for the priority area and could be quickly brought up to functioning standard following local consultations to ensure that the detailed plan met local needs and that people wanted to have a responsibility for water management.

2.2.4 Remainder of region

Options are still being considered at a more general level in other parts of the region, for example flood protection in the upper reaches of the minor rivers, and the possibility of a short interceptor drain on the middle Bengali. However, the one area where it is obvious that major replanning of FCD is required (see FAP 12 reports also) is the lower Atrai basin. In this area FAP 2 is still formulating alternatives for a general strategy, and it seems likely that refinement of these into a more detailed plan of protection, partial protection and conservation areas over such a large and complex area will take a considerable time. There are likely to be important problems in developing operating plans and involving local people when some

do not benefit, but it is not clear whether there are any project areas in this area which would be suitable for pilot O&M improvements given the replanning involved.

2.2.5 Implications for FAP 13 second phase

Therefore there are three areas in which a follow-up to FAP 13 might provide assistance to the north-west region:

1. Advice and collaboration in planning interventions to enable local involvement in O&M including use of infrastructure and covering both embankments and internal water management.
2. Pilot work to improve maintenance of a stretch of major embankment linked with secondary use for safe settlement by those displaced by erosion.
3. Pilot work on water management and FCD O&M, including possibly controlled flooding in the Kumarnai Bund project, but this would depend also on close collaboration with SRP.

2.3 FAP 3 NORTH-CENTRAL REGIONAL STUDY

2.3.1 Background

The North-central region is relatively small but includes both high lands which are more-or-less flood free and lowlying deeply flooded areas. The regional study has been more concerned with the macro view of the area and identifying where the returns are likely to be greatest from flood protection works and the general nature of the works which would be appropriate. However, at an early stage the Jamalpur area in the north-west of this region has been separated out as a priority area for flood mitigation works (FAP 3.1 Section 2.4).

The Draft Final Report (FAP 3, 1992) suggests a combination of measures similar to those being developed under FAPs 3.1 and 20. The highest priority areas under FAP 3 lie between these two pilot areas and are likely to combine similar approaches: embankments, control and semi-control structures, drainage improvements and internal compartments. In addition large areas of lowlying land are likely to remain flood prone and would hence require improved measures to strengthen flood coping ability such as flood proofing.

Consequently there has been no unusual or innovative treatment of O&M at this stage by FAP 3: the FAP Project Appraisal Guidelines (FPCO, 1992) have been followed for indicative O&M cost estimation. However, one issue raised at the pre-feasibility stage is the implicit trade-offs made in estimating economic costs between construction and maintenance costs. A reaction to the generally poor state of maintenance in existing embankments may be to cost in better construction standards - more allowance for shrinkage through greater freeboard or better compaction. This trade off between capital and recurrent costs appears to deserve more attention (a subject for follow-up study under FAP 13). However, it is likely, because of discounting, to adversely affect the economic return unless a premium is placed on avoidance of future risk of failure, or on domestic resources as opposed to foreign aid (since recurrent costs are normally covered by local resources whereas implementation is usually assisted by foreign donors).

There are no projects at present where improvements and innovations in O&M are being tested in the region.

2.3.2 Future developments and linkage with FAP 13 phase 2

Further developments in the FAP 3 region will depend on the level of interest in the highest priority areas, which are RS2 to the south of Jamalpur and RS3 at the Dhaleswari. For any priority area feasibility studies will be required before detailed design, so any FAP embankments are some years ahead (assuming any are built in the region). Advice on O&M might be more useful once the detailed planning stage is reached. Options for O&M monitoring in the region are mostly covered by the two pilot projects (FAPs 3.1 and 20) since these are projects where more participatory approaches will be followed. It is vital that the experience in participatory planning is built into future project planning, and that it leads into participation in O&M.

One of the first round FAP 12/13 evaluation projects (Katakhali Khal) is located at the northern end of RS2 adjacent to the Jamalpur Priority Project (JPP) area, this might be a useful O&M control area for monitoring performance under current management, and this might be useful in planning for RS2 and for comparison with the Jamalpur Priority Project.

One other project discussed with FAP 3 is the Shila River FCD project (Upper and main components) which apparently included water management plans akin to controlled flooding and compartmentalisation - the feasibility studies include discussion of the problems which might arise from linked FCD projects and some detailed suggestions for polder management and organisation of O&M, all of which might have provided very useful lessons for FAP. However, this project was reportedly not completed due to opposition from local farmers when the works worsened drainage conditions. Whilst it might provide an additional opportunity to experiment with controlled flooding it might require some substantial works in order to produce an effective project, and this may place it beyond the scope a pilot O&M project.

2.4 FAP 3.1 JAMALPUR PRIORITY PROJECT STUDY

The area along the left bank of the Jamuna from close to the offtake of the Old Brahmaputra (north of Bahadurabad) south to the Jamuna Fertiliser Factory (south of Sarishabari), and extending inland as far as Jamalpur, has been identified as a potential priority area for works under FAP and a feasibility study is in preparation. The form of any interventions in this area is thus still subject to refinement and discussions. However, it would appear (FAP 3.1 Interim Feasibility Report, 1992) that a combination of the following measures might be adopted: drainage improvements, flood protection (rationalising and strengthening existing embankments), and flood proofing in charlands and adjacent unprotected areas.

The study gives a limited treatment of O&M in keeping with the emphasis on defining potential impacts and project options. However, O&M costs may be a higher percentage of investment costs than the norms given by FPCO (1992) since the project is likely to involve rehabilitation and improvement to existing embankments and drainage systems, which have been noted to be in poor states of repair. The need for coordination and local representation in system management is noted by the study, and farmer involvement might be achieved through drainage area groups or committees. Any institutional arrangements should take account of those being developed under other projects such as SRP.

It has been suggested that initially pilot projects be taken up within the area, especially for drainage improvement, and possibly for flood proofing. Moreover it is anticipated that embankments under the project would be planned, built and managed with multiple uses in mind, and that fisheries mitigation measures would be established as part of the project - which will affect project design and especially operation for a mitigatory programme.

There is obviously scope for the FAP 13 follow-up to be involved in:

1. An advisory role in the more detailed project planning - particularly consultations with local people and planning of multiple use infrastructure, and in the institutional arrangements.
2. Pilot O&M work, depending on the time-table of implementation, particularly in the proposed pilot drainage improvements and in embankment design, maintenance and use.
3. The flood proofing programme should be carefully monitored to check on the maintenance costs of raised houses and shelters and hence the sustainability of these measures, and to check on the operational effectiveness of flood warning systems. This would provide feedback essential to any further expansion of such programmes to other unprotected areas.

2.5 FAP 4 SOUTH-WEST REGIONAL STUDY

2.5.1 Background

This study covers both the south-west and south-central regions which are already extensively covered by FCD/I projects. Water management issues are somewhat different from the other regions in that dry season river flows are of much higher importance because of the issue of saline water intrusion in the south-west of the region, and for irrigation water. Additionally there are relatively dry areas in the western side of the area, deeply flooded areas on the eastern side, and coastal polders open to cyclone risk in the south-east.

FAP 4 has been directed to investigate three urgent issues as part of the general regional planning:

- the Gorai;
- the lower Padma floodplain; and
- the CEP polder complex in the south-west.

2.5.2 Options arising

Studies are still on-going, but some of the options being considered are discussed as they have O&M implications.

For the Gorai system a controlled offtake from the Ganges is under consideration which could supply water for salinity control (which would mostly flow down to the Rupsa near Khulna) and possibly for use in irrigation. This might be augmented by water from another offtake lower down the Padma. However, it is the monsoon season in the same system which would offer greater scope for operating problems and improvements. A macro-level option,

if there is a control structure on the Gorai, is to limit the inflow from the Ganges in the monsoon, but this would depend on finding a volume which did not have knock on effects on subsequent dry season salinity levels.

A series of relatively large polder-type projects border this river and it may be that water management could be improved by converting them to smaller compartments which might be interlinked, and for which the improved modelling capabilities now available might identify replanning of drainage infrastructure and operating practice (by finding which rivers have the lowest levels in the monsoon). There are potential conflicts over the passing of water/floods between compartments if the structures are operable, but having fixed crest weirs, for example, would ignore the benefits of different water levels at different stages of the Aman growing season. It would require considerable local consultations and surveys before any such potential benefits can be identified in the existing project areas, since the projects north of Narail have not been evaluated. Kolabashukhali at the southern end of this area might be an alternative for such experimentation since it was evaluated by FAP 12 and is listed for rehabilitation under SRP.

Along the right bank of the Padma-lower Meghna south of Faridpur is a substantial area open to floods for which polder type projects might be considered. However, the issue of confinement of floods and erosion risk would need careful study and this area may be better suited to floodproofing.

The other priority area where there are important operating implications is in the complex of coastal polders in the Khulna-Satkhira area. Here silting up of the channels between polders has been a serious problem affecting drainage. The strategy being considered is to limit the number of live channels and to manage the polder system to ensure that these stay open. This might involve compartmentalising larger polders, or joining together smaller ones, so that saline water could be allowed to flow in and out of parts of the polders in a controlled way. However, any improved water management system for these areas would have to take into account the different land uses present and actual conflicts of interest such as those between farmers and shrimp cultivation. It seems clear that a strong institutional framework to regulate agreed uses (such as a polder board), local consultation, and participation in management will all be necessary to achieve an integrated polder management system. The existing polders where O&M are being improved under Delta Development Project are managed as individual units. Although cluster polder management seems to be a high priority it does not appear that there is any obvious group of polders where pilot work could start soon, and in any case this would be a long term project which would most likely take longer than four years to plan and consult over, implement and then develop a management system.

Additional issues in the region are largely related to irrigation, for example whether the Barisail Irrigation Project can be made effective or some of the sunk costs directed/used productively; and whether the drier western side of the region can receive irrigation water given the overuse of groundwater.

2.5.3 Implications for O&M

Existing initiatives for improving O&M in the region fall into three categories (see Table 3.1):

- irrigation management in the Ganges-Kobadak Project;

- polder management south of Khulna (Delta Development Project - DDP); and
- polder management in the Patuakhali area - a concentration of sub-projects under SRP, EIP, and SSSFCDDIP.

The latter two are of most relevance to the remaining water management problems in the region. There would appear to be little point in having a further pilot O&M project in Patuakhali, but the experience of the different approaches there should be monitored and assessed in any FAP 13 follow-up. The key problem would appear to be finding a sustainable polder development model in the areas north of the Sundarbans. This is the remit of DDP which is expected to be developing such an institutional framework and studying polder clustering, an option arising from FAP would be to strengthen the latter activity.

An area without O&M improvements at present is the system of beel projects along the Gorai system. There do not appear to be confinement problems, unlike the Chalan Beel area for example, so this area appears to be suited to pilot O&M initiatives linked with beel conservation areas and fisheries development. Kolabashukhali Project has several advantages for such work (Section 3.2), but may have less scope for compartmentalisation than some other projects.

2.6 FAP 5 SOUTH-EAST REGIONAL STUDY

The south-east region is relatively small and already contains a number of major FCD/I projects, notably the Chandpur Irrigation Project where SRP is working to improve O&M. In the coastal area the Land Reclamation Project has been working on reclamation and polder management. Immediately adjacent to the region is the Muhuri Irrigation Project which also is a focus project for improved O&M under SRP.

There do not appear to be major O&M issues arising in options being developed under the south-east regional study. A major option is improved drainage so that flood duration, rather than peak depth, is reduced. In Noakhali this would involve minimal operation (designs using counter-weighted flapgates to manage inflows and outflows without a need to operate gates). Main system drainage might be improved and this could automatically lead to drainage improvements in the catchment area. Potential for cost recovery is zero given the ill-defined benefits. However, it may be that on-farm/small scale water management is needed to take advantage of the benefits - and this could be an area for innovation - for example in farmer groups

In the northern parts of the region (Gumti area) a feasibility study is scheduled. A mixed strategy seems quite likely, possibly involving traditional embankments, submersible embankments and flood proofing. There do not appear to be any additional O&M issues raised in such strategies, except that because water levels rise later in this area than in the north-east there is a better opportunity for submersible

Idea for initial establishment of vegetative protection on embankment:

Loose woven jute matting-netting impregnated with appropriate mix of grass seeds or other plants, which could provide immediate protection to newly resectioned embankments, help establish beneficial ground cover, and would be bio-degradable as ground cover matured.

Courtesy FAP 5

embankments to be designed so that water levels equalise before the embankment overtops so reducing annual maintenance requirements. However, the need for such embankments is not certain and may depend on the consequences of upstream developments (submersible embankments) in the north-east region.

Hence there does not appear to be a need for further pilot O&M initiatives in this region at present, although lessons from submersible embankments in the north-east might be of use, as would experience in flood proofing gained in Jamalpur, for example (although the issues are somewhat different since river erosion is not a problem). An advisory input on O&M in any detailed planning and design would seem most appropriate.

2.7 FAP 6 NORTH-EAST REGIONAL STUDY

2.7.1 Background

This is one of the largest areas covered by a regional study, and has a longer timescale - draft regional plan scheduled for late 1993. So far the study has been concerned mainly with detailed background studies to define the issues and problems. The most relevant of these studies for O&M are:

- A review of all existing FCD/I projects in the area based on a review of documentation and short visits to them to assess their current operating status. The purpose was to identify the main problems arising in FCD/I projects in the area, and it may identify where rehabilitation is required.
- Detailed monitoring of Shanair Haor project - regarded as a relatively good submersible embankment project (adjacent to Halir Haor evaluated by FAP 12). This is in much greater depth than the RRAs under FAP 12, comprising: detailed baseline surveys covering all major disciplines with additionally hydrological monitoring of the filling up of the haor and of waves for example. However, there is no direct monitoring of operation or maintenance. In 1992 the embankment was cut letting in floodwater after the main harvest but before a secondary ratoon crop could be harvested/gleaned by the landless.
- Detailed study of Monu River Project, a relatively large and complex project which poses flood management issues which might be applicable in other areas. In particular there may be potential to create a conservation area which would provide flood storage and would reduce adverse environmental impacts.

2.7.2 Future

A number of issues emerge from the preliminary stages of the study:

- sedimentation and drainage changes are a common problem in the area and may have been made worse by submersible embankments;
- nevertheless submersible embankments seem likely to not only continue but to be implemented in more areas. However, work will be needed to try to improve their performance, which it was observed did not always meet local

expectations for a variety of reasons including planning and implementation problems which are subsequently manifest as Q&M problems; and

projects are likely to emerge which lie outside the traditional rural water sector of FCD/I projects, for example wetland conservation, fisheries and even tourism. Presumably this has implications for inter-agency collaboration which will need attention.

2.7.3 O&M implications

Two aspects of FCD where improvements in O&M in the region seem particularly appropriate arise from FAP 12/13 studies and from FAP 6:

1. Although submersible embankment projects show generally very good economic returns and are appreciated by farmers they do have relatively high maintenance costs. Detailed tests to reduce maintenance requirements and so improve maintenance are not being undertaken by the existing initiatives to improve O&M in FCD projects. Implications might be for experiments with operating practices and structure design, but also for vegetative protection. The loss of trees in the haor areas is a serious issue (for example *Hijal Barringtonia acutangula* which is important as a material for homestead protection). There is potential to test submersible embankment plantation programmes which might also protect the embankments during overtopping.
2. Maintenance costs might be raised locally. Even if trees or other vegetation help in reducing maintenance costs, maintenance will still be needed and is likely to be funded externally under FFW programmes. However, submersible embankment projects are simple in concept and the benefits are easily identified, so they may be the most appropriate projects for attempting cost recovery in FCD projects to cover maintenance costs.

In both cases it would be essential to ensure that the pilot O&M project was essentially sound and fulfilled local needs. It would appear that such a project would complement existing O&M initiatives and the work of FAP 6.

2.8 FAP 7 CYCLONE PROTECTION PROJECT II

2.8.1 Background

The project was assessing rehabilitation needs in the eastern parts of the Coastal Embankment Project at the time of the April 1991 cyclone. Subsequently it has been divided into two phases:

1. Priority resectioning and retirement of the seaward facing parts of the polders most badly affected in the cyclone: from Cox's Bazar to Sandwip; and
2. Designing similar resectioning and retirement of embankments from Sandwip along the Noakhali coast towards Khulna. Although Bhola does not fall within the project it will follow the same designs and approach.

The intention is to build in afforestation as a means of protecting the embankments in phase 2, and this will be added into phase 1. The projects where work is or will be undertaken are:

a) Emergency programme

Polders: 61/1, 62, 63/1A, 64/1A, 64/1C, 64/2C, 66/3 69, and 71 (Cox's Bazar northwards); plus 72 (Sandwip).

b) Phase II

Teknaf, Polders 66/1, 70, 72 (Chittagong); 59/2, 59/3B, 59/3C, 60, 73/1B (Noakhali coast plus Hatia); 56 and 57 (Bhola); and 35/1, 40/2 and 48 (Khulna and Patuakhali).

Hence this is an implementation project which is at a more advanced stage than FAP in general. Moreover maintenance (but not operation) is seen as the key element in improving the CEP polders since they were in a poor state of repair prior to the cyclone, and it has been observed that damage was less where there was effective tree protection on the seaward side.

The maintenance proposals of FAP 7, currently under discussion (July 1992) with a World Bank appraisal mission, contain a number of elements also suggested in FAP 13, and it is thus clear that any follow up to FAP 13 should work closely with FAP 7 on the improved O&M aspects. Details of the forestry proposals are discussed in the FAP 13 working paper on FCD projects and social forestry. The following section gives an overview of the treatment of O&M and issues emerging from FAP 7.

2.8.2 Maintenance proposals

Where necessary the embankments are being retired to give sufficient setback from the sea, this creates an area which no longer benefits from flood protection. Moreover, it is proposed to change the landuse of these areas to forest to minimise maintenance problems, by dissipating wave energy and helping to accrete land in front of the embankments. Hence similar issues of directing benefits to disadvantaged groups and linking this with maintenance arise just as in non-coastal projects. Additionally the coastal embankments are relatively large, seaward slope of 1:7 and landward slope of 1:3, hence there is a large public resource available for use, and which without a plan for resource management will in any case be settled by the landless and displaced persons, or controlled by local elites.

The embankment has not been designed with a specific berm for settlement. However, it is anticipated that the relatively gently slope will enable people to settle, and that this will be formalised (rules will be needed to prevent damaging uses). Hence one issue is how to lease out sections of embankment for settlement while ensuring that they are not so attractive that more influential or richer people take them over. Two types of settler need to be catered for: those whose homes lie between the old and new retired embankments, and the landless who already squat on the embankment and will continue to do so.

Accepting and planning for settlement does not in itself improve maintenance or ensure system sustainability. FAP 7 is working with the Forestry Department to develop models for forest development which could yield a worthwhile return for these people and would help to protect the embankment - reducing maintenance needs and increasing security in a cyclone.

This would essentially involve a mixture of mangrove, other timber trees and fruit trees. Financial analyses of the returns are being developed, but it is expected that there would be no returns in the first five or so years.

The social forestry aspect raises two problems:

- the appropriate length of embankment for a household's tree cultivation. This is essentially a bonus for many of those who may anyway settle on the embankment and in the process get free homestead land; and
- for those whose land will no longer be protected from sea flooding and who will be required/persuaded to convert their land to forest an assessment of the returns from forestry compared with their previous landuses is necessary (which should take into account the past risks and expected returns and current risks). In theory the switch to forestry should be less risky but may have a lower annual average return and is likely to be lumpy (no return for some years and then returns every few years). Institutional mechanisms will be needed to provide credit or subsidies over the initial period. If the forest landuse has lower returns a compensation mechanism would be needed possibly from those who are protected to those who are not.

There appears to be potential for additional shorter duration agro-forestry practices to be included in the programme, at least on the embankments if suitable 'inter-cropping' systems can be devised (perhaps using perennial crops), so that some returns are achieved earlier and thus participants can obtain a more immediate benefit (FAP 13 working paper on social forestry and FCD may help in this regard).

It is not clear how BWDB would ensure that routine maintenance of the embankment is up to standard if settlers on the embankment have duties to keep their section in good shape. The best option may be to have settlers belong to NGO or BRDB cooperatives/groups and for annual credit arrangements to support tree cropping (and the embankment lease) to be conditional on inspections to ensure that the embankment is in good condition.

One interesting advance in monitoring of maintenance is the use by FAP 7 of videos of the embankment taken from helicopter flights. This provides a permanent record and instant accountability for even the most remote reaches of embankment, and could be used to verify payments for work, and lease renewals or evictions in a fair and objective way. Apparently the cost need not be prohibitive (2 days to cover the FAP 7 study area), but it obviously would be a substantial cost if used to monitor BWDB embankments on a large scale. Nevertheless this idea might be considered as a standard maintenance monitoring programme by BWDB, perhaps instituted in other regions initially under FAP. Possibilities for cost saving could be using light aircraft or making routine monitoring part of the military's training programme.

2.8.3 Implications for other FAPs

The plans to legalise embankment settlement, and mechanisms adopted for this, will be directly relevant to many other embankment projects, particularly those along the main rivers where erosion and retirement create almost identical situations. Institutional arrangements for local participation in maintenance may likewise be transferable.

Some aspects of the forestry programme may also be transferable such as trees on the embankments themselves - so the impact of this should be closely monitored. However, in a riverine situation protective forest areas would not be wanted if they accelerated siltation of river channels, nor will experience with mangroves be relevant to other areas.

The programmes under FAP 7 are expected to be implemented by BWDB, the Forest Department and NGOs. The success of such programmes can only be assessed over the medium-long term (forest production and maintenance performance), and the experience needs to feedback into projects outside the coastal zone and to have linkages with current improvements in O&M.

Hence the area for follow-up by FAP 13 would be a monitoring and advice programme for BWDB (for or with FAP 7) covering this experiment, since it is vital that the experience gained in such experiments is used in learning how to improve FCD resource management and user participation elsewhere, and what mistakes to avoid.

2.9 FAP 9A SECONDARY TOWNS INTEGRATED FLOOD PROTECTION PROJECT

2.9.1 Background

This project will combine: urban flood and bank protection, drainage improvements, and general improvements in public health/living standards (through improved sanitation and solid waste disposal, and slum improvement). The feasibility study has been completed and detailed design is in progress with implementation due in 1993. Six towns are being protected: Dinajpur, Habigonj, Khulna, Kurigram, Moulvi Bazar, and Panchagar, and the works are to be implemented by a combination of BWDB and the Municipalities (with LGEB assistance).

2.9.2 O&M Implications

A key element in the project is the provision for cost recovery: the ADB Aide Memoire notes that:

"For the first time in the country, the beneficiaries will contribute upto 50 percent of the O&M cost of flood protection; such a commitment could be institutionalised on a country-wide basis in future projects." ADB (1992) p15.

Although BWDB will be responsible for implementation and O&M of flood control, it is expected to receive 50 percent of O&M costs from the local governments which will charge effectively a land improvement tax. It is expected that the multiple benefits of the project will be reflected in an increasing real value of land in the six towns, that agricultural land will be reclassified as urban, and that an ad valorem land tax will be imposed. The same arrangements for O&M cost recovery are planned for works implemented under FAP 8B, but there have been delays in setting up such systems since they involve inter-ministerial coordination.

2.9.3 Participation, monitoring and evaluation

The planed interventions are supposed to have active contributions/consultations with local residents over the detailed designs. However, consultation so far would appear to have

been limited, more work may be needed on flood impacts, impacts on women (likely to be much affected by changes in sanitation), and opinions on possible investments and services and the charging of taxes to pay for these. This participation and the progress of the project and cost recovery would be subject to monitoring and evaluation.

There is provision for a Project Management Office in BWDB under a Project Director and with a monitoring and evaluation section comprising an economist, statistician, sociologist, community development specialist, and three social workers; this would work closely with equivalent smaller units in the municipalities. Duties would include planning, supervision, standardising O&M, monitoring, sample surveys of public perception of the project including management and cost recovery, and public awareness campaigns. FPCO is also expected to have an overall responsibility for monitoring, evaluation and feedback during the post-implementation O&M period.

2.9.4 Implications for FAP 13 follow-up

It is clearly important that the experience gained in implementing FCD O&M cost recovery and in inter-agency collaboration be monitored and assessed since it could offer a model for similar approaches in rural projects (where the impacts on agriculture may be more apparent than those on urban society). However, the provisions for feedback appear to be limited to within the project and do not build on the existing structure of the agencies, and may not facilitate cross-divisional learning - for example the lack of linkage at present with O&M initiatives including cost recovery programmes of BWDB under SRP, and with existing M&E set-ups.

2.10 FAP 20 COMPARTMENTALISATION PILOT PROJECT

FAP 20 involves pilot work to apply principles embedded in the Flood Action Plan: sustainable water management systems and public participation in planning, design, implementation, and O&M of interventions appropriate to local needs. Close liaison and collaboration with FAP 20 is obviously vital for pilot O&M initiatives and for monitoring and feedback processes.

So far work has concentrated on the Tangail pilot area in the north-central region, but survey work in Sirajganj pilot area in the north-west region will be expanded shortly. Timetables of any physical works are not clear at present, since by its nature extensive consultation and a 'bottom-up' approach to development takes time (but should avoid many of the social and environmental problems which have been observed in other FCD/I projects). This has direct relevance to O&M and sustainability. The argument which has developed is that only when there is local involvement and responsibility for management and a system which delivers benefits which are appreciated by people is there likely to be effective local resource mobilisation to cover O&M and operation which is sensitive to farmers' needs.

The approach of FAP 20 (FAP 20 Inception Report, 1991) will lead to very relevant 'pilot O&M' work for FAP and FCD/I projects in general, and is expected to be particularly relevant in terms of developing better monsoon water management. The approach is consistent with, and a logical extension of, that developing in BWDB (under SRP for example) in that system management would be responsive to local needs. The same approach to planning rehabilitation (since the pilot compartments already have FCD infrastructure) could be adopted in any major rehabilitation works under SRP for example. Hence there is some

need for a two way feedback process into both FAP related planning and into rehabilitation and O&M outside FAP, as well as from these sources into FAP 20.

Potential for involvement in the second phase of FAP 13 might be:

1. Two way advice over O&M between FAP 20 and pilot O&M projects, the latter may be able to test some measures in advance of FAP 20;
2. Involvement in monitoring of the pilot compartments - there already is provision for this in FAP 20, but it is not clear whether this will be entirely consultant led or whether it will strengthen BWDB capability; or indeed who would undertake some of the continuing studies, as most FAP studies would be completed before the need to monitor and adjust and then evaluate FAP 20's work is ended; and
3. Assisting in dissemination of lessons learned to other FAP and non-FAP components and agencies.

3 NON-FAP PROJECTS INVOLVED IN IMPROVED O&M

3.1 INTRODUCTION

This section supplements the FAP 13 Final Report (1992) by providing updated information on a number of projects, and specifically by discussing the characteristics of the sub-projects where improvements in O&M are being implemented, the nature of the experiments underway, and potential links with FAP.

3.2 SYSTEM REHABILITATION PROJECT

3.2.1 Dutch component - improved O&M

Table 3.1 lists the focus projects where SRP is currently working to improve O&M, concentrating on: water management, on-farm development, better programming of maintenance, routine maintenance work, and cost recovery. There is at present an emphasis on irrigation systems although these also comprise flood control elements. Since the approaches developed will become BWDB practice it is clear that the same framework should be relevant to O&M in FAP, but issues arising out of FAP need also to be addressed in developing improved O&M. This latter offers the opportunity for pilot O&M emerging from FAP to complement SRP if it results in trials which would not be undertaken by SRP or if it gives earlier results to technical or institutional issues than would be the case otherwise.

Hence any additional pilot O&M projects should be decided only after detailed discussion with SRP. Also there is a need for liaison between FAP studies, and more importantly between detailed planning and implementation arising from FAP and the O&M Directorate responsible for SRP.

3.2.2 EC component - feasibility studies and training

This project is essentially concerned with the feasibility studies for some 63 FCD/I projects of BWDB where rehabilitation is planned. The studies are being carried out over approximately three years. It is not clear how quickly implementation of rehabilitation of these projects will occur, or how commitment to improved O&M is to be linked with rehabilitation, or how and whether the rehabilitation projects fit into the priorities of the relevant FAP regional studies.

There is obviously scope for coordination and liaison between these activities, both to prevent inappropriate rehabilitation, and because rehabilitation may create opportunities for the types of water management improvements envisaged in FAP. At the same time there would appear to be a need for the participatory approaches to problem definition and project planning being developed under FAP (FAPs 2 and 20 for example) to be used in planning this type of rehabilitation, otherwise the same O&M problems being addressed in the Dutch component may reappear and the potential for ready transfer of the improved O&M approaches developed in the initial focus projects under SRP may be constrained.

Table 3.1 FCD/I Projects of BWDB where O&M is being improved

O&M Project	FCD/I Sub-Project	Region	Gross area(ha)	Project type	Details of programme
SRP (Neth.) landless	Karnafuli IP	out-SE	23482 ha	Irrig	(Water management to serve (farmers - operating plans; (Preventive/periodic (maintenance through
	Muhuri IP	out-SE	40080 ha	Irrig	(groups; cost recovery - (irrigation fees.
	Chandpur IP	SE	53850 ha	FCDI	drainage planning/O&M maintenance groups
	Nawabganj O&M	NW	40000 ha	FCD	on-farm development, irrigation management
	Buri Teesta IP	NW	11876 ha	Irrig	on-farm development
	Polder 55/1	SW	10800 ha	FCDI	
SSSFCDI(Can)	Panchanala Koya	NW	2400 ha	Sup irrig	water management, income generation, high consultant involvement
	Sutajuri Khal	NE	650 ha	FCD	just completed
	Bamansundar	out-SE	4000 ha	FCD	low BWDB interest, consultant involvement
	Shak Borak	NE	4520 ha	FCD	high BWDB interest, low consultant involvement
	Polder 47/2	SW	850 ha	FCDI	normal BWDB, low consultant involvement
EIP	Polder 43/2C	SW	2753 ha	FCD	routine maintenance, trials of vegetative protection
DDP	Polder 29	SW	8215 ha	FCDI	water management, on-farm development
	Polder 22	SW	1417 ha	FCD	routine maintenance
LRP	Char Bagger Dona	SE	1600 ha	FCD	reclamation and polder development: settlement, agriculture, maintenance
GKRP	Ganges-Kobadak IP	SW	197608 ha	Irrig	irrigation management, cost recovery.

NB. Some of the mainly irrigation projects have some FCD elements, but these are generally not the main focus of the O&M initiatives. Not listed are a number of small FCD projects of local government under LGEB's RESP water management. Also not listed are: the 65 FCD/I projects of BWDB currently being assessed for rehabilitation under SRP (EC component) and which if rehabilitated would be expected to follow the improved O&M model developed by SRP; and the many small structures and rehabilitation projects under SSSFCDI which might also follow management models being developed by that project. Sources: O&M improvement project reports; MPO National Water Plan (1991).

Notably out of the projects listed for feasibility studies of rehabilitation two were evaluated by FAP 12/13: Halir Haor in the north-east and (Barnal-Salimpur-) Kolabashukhali Project in the south-west. Both were found by FAP 12 to be economically successful projects and so they might be good additional early pilot projects for O&M improvements which would complement the current spread of O&M improvements under the Dutch component. It is not certain that they are the highest priorities in their FAP regional studies, but in the case of Kolabashukhali there would be the additional advantage that it is subject to a current fisheries mitigation project through re-stocking under the World Bank funded Third Fisheries Project and so offers the opportunity to incorporate this programme within the management plan. If not taken up for Pilot O&M work, they would be appropriate for continued O&M monitoring.

In addition both of the projects studied in detail by FAP 6 (north-east - Section 2.7) are in the list of potential rehabilitations, so Shanair Haor would be another possible project for pilot O&M work. As noted in Section 2.2 Kumarnai Bund Project is also in the SRP list and lies within the Gaibandha Priority area of the north-west.

3.3 SECOND SMALL SCALE FLOOD CONTROL DRAINAGE AND IRRIGATION PROJECT

3.3.1 Background

This project provides technical advice and funding for small structures/small projects of BWDB. The normal procedure under this project is for a pre-project public meeting to be held to discuss and gain acceptance of the proposed works (not participatory planning), and for project and structure committees to be established at completion to coordinate and involve local farmers in management. Problems with subsequent O&M of this type of project have led to a pilot O&M programme.

3.3.2 Pilot O&M

Five sub-projects have been taken up for pilot O&M improvements (see Table 3.1), these are all relatively small FCD/I projects. The model adopted is to employ a Field Operations and Maintenance Specialist (FOMS) in three of the pilot projects to give technical advice to the farmer groups - structure societies (Prokolpa Porichalona Samities - PPS), assist communications between this level and the Project Committee (PC), facilitate involvement by NGOs in the area, and monitor project performance. Local resource mobilisation is seen as an important component of the projects - with the aim of creating an O&M fund controlled by the project - the process is for a local NGO to be assisted in gaining access on behalf of the PPS and poor households (women in particular) to project land to both earn an income and to generate an O&M fund.

The five pilot sub-projects have been organised into something of an experimental pattern to test the level of input from outside needed to establish sustainable PPSs. Thus the first three sub-projects have external FOMS assigned, NGOs involve and varying levels of BWDB interest. The two additional sub-projects do not have FOMS assigned (although they will be monitored), in one the local BWDB staff are keen to improve O&M so the aim is that there would be minimal external involvement and BWDB would experiment in PPS formation, while in the other it is hoped to find an NGO which could take on this role.

There is provision for monitoring of the pilot projects. However, it is not clear how the PPS will be assisted (advised) regarding operational monitoring and decision making, or in prioritisation of maintenance works. Much of the monitoring appears to be geared to evaluating the past impacts of the projects rather than providing a baseline from which feedback can be generated to improving the experiments during the duration of intervention, and from which the impact of the interventions can then be assessed. Nor does there appear to be much emphasis on institutionalising monitoring or evaluation into BWDB or the projects themselves to facilitate improving O&M and project performance.

3.3.3 Implications for FAP 13 follow-up

The inter-linkages between SSSFCIP and other projects involved in improving O&M seem unclear. It may not be appropriate to attempt to build into BWDB practice work which is by definition experimental, but nor is it clear how lessons learnt will be absorbed into BWDB practice - BWDB involvement in the monitoring process might improve this. At the same time lessons learned need to have a wider impact than just in other small-scale works under the same project.

3.4 OTHER INITIATIVES

Under Early Implementation Project, Delta Development Project and Land Reclamation Project (all BWDB projects with Dutch assistance) there are initiatives to improve O&M, especially polder management, in selected projects. The emphasis is in the coastal areas, it would seem appropriate to feedback experience of these projects into FAP planning in these regions, and possibly to strengthen the pilot nature of the work, for example to test ideas that may emerge from FAP 4's studies.

3.5 LINKAGE BETWEEN EXISTING O&M IMPROVEMENTS AND PILOT O&M UNDER FAP

While most of the main types of FCD/I project are represented in existing initiatives to improve O&M, Table 3.2 shows that there are some important gaps. In particular FCDI and irrigation projects are over-represented while typical FCD projects are under-represented. Main river embankments and submersible embankments are not specifically covered in existing initiatives. Although the key issues in improving O&M are being addressed in the various projects discussed in this section, specific O&M issues relevant to both the existing infrastructure and any investments which might be made under FAP appear to deserve more attention.

From an infrastructure viewpoint main river embankments, water management in non-coastal FCD projects, and submersible embankments appear to be gaps. It is not clear whether there are appropriate projects with provision for such concepts as controlled flooding until pilot/priority projects of FAP have found whether this is appropriate and then implemented any necessary works. From an institutional viewpoint areas which appear under-represented include: resource mobilisation in FCD projects, multiple uses and leasing of project infrastructure, and operation of mitigatory measures to reduce adverse fisheries impacts.

Pilot O&M emerging from FAP might have the additional advantage of providing a definite linkage between the improvements in O&M underway in existing projects, and the

planning and re-planning involved in FAP leading to new or revamped projects; and between participatory planning and attention to a greater diversity of impacts (environment, social etc) in FAP and its implications for existing projects. Such linkages should be strengthened if the findings of the FAP studies are to be built into practice in the water sector and the different agencies with potential interests in FCD/I projects.

Table 3.2 Breakdown of FCD/I pilot O&M projects compared with FCD/I infrastructure

a) Region	No	gross ha	% pilot	O&M % total FCD/I ¹
NW	3	54276	13	33.4
NE	2	5170	1.3	7.7
NC	-	-	0	1.3
SW+SC	6	221643	55	36.8
SE	2	55450	14	14.7
Outside (SE)	3	67562	17	6.0
b) Project type				
Irrig	5	275446	68)	21.7
FCDI (non-coast)	1	53850	13)	
FCDI (coastal)	3	19865	5)	
Main river embank	-	-	0	13.5
FCD (mainly drain)	1	40000	10)	26.3
FCD (non-coast)	2	5170	1)	5.3
Submersible embank	-	-	0	
Flash flood protect	-	-	0	1.1
Coastal Embankment Project				
(semi-saline)	(4	9770	2	14.3
(open coast)	(17.6
Total	16	404101	100	100

Notes 1 Based on updating of database used in FAP 12 project selection (FAP 12 Methodology Report, 1991), only projects with a flood control element included, hence irrigation-only and drainage-only projects not included in breakdowns

Sources: Reports of and discussions with pilot O&M projects.

REFERENCES

Asian Development Bank, 1992, **Aide Memoire of the Appraisal Mission on Secondary Towns Integrated Flood Protection Project.** ADB, Dhaka.

Government of People's Republic of Bangladesh FAP 3, 1992, **North Central Regional Study Regional Water Resources Development Plan Draft Final Report.** FAP 3, Dhaka.

MIWDFC FAP 2, 1992, **Gaibandha Improvement Project.** North West Regional Study Working Paper 7. FAP 2, Dhaka.

MIWDFC FAP 3.1, 1992, **Jamalpur Priority Study Interim Feasibility Report.** FAP 3.1, Dhaka.

MIWDFC FAP 13, 1992, **Operation and Maintenance Study Final Report.** FAP 13, Dhaka.

MIWDFC FAP 20, 1991, **Compartmentalisation Pilot Project (FAP 20) Inception Report.** FAP 20, Dhaka.

MPO, 1991, **National Water Plan.** Ministry of Irrigation Water Development and Flood Control, Government of Bangladesh, Dhaka.

SSSFCDIP, 1992, **Operation and Maintenance Follow-up Program work plan for 1992-1993.** BWDB, CIDA, World Bank.

MODIFIED LIST OF COMPLETED PROJECTS UNDER BANGLADESH WATER DEVELOPMENT BOARD.

Pre-WAFDA Period	: Completed upto 1958-59	= 32 Nos.	Appendix-A1	Page	1-3
Pre-Liberation period :	" " 1959-60 to 1970-71	= 111 Nos.	" A2	"	4-9
Post Liberation period :	" " 1971-72 to 1972-73	= 10 Nos.	" A3	"	10
First Five Year Plan :	" " 1973-74 to 1977-78	= 47 Nos.	" A4	"	11-14
Two year plan :	" " 1978-79 to 1979-80	= 37 Nos.	" A5	"	15-18
Second Five Year Plan :	" " 1980-81 to 1984-85	= 153 Nos.	" A6	"	19-28
Third Five Year Plan :	" " 1985-86 to 1989-90	= 47 Nos.	" A7	"	29-35
Fourth Five Year Plan :	" " 1990-91	= 15 Nos.	" A8	"	36-37

Total completed upto June, 1991 = 452 Nos.

Consolidated list of Coastal Embankment 79 polders.

Consolidated list of 62 Water Control Structures.

Yearwise Expenditure under Development Head since inception of AWDB (EF WAFDA)

KA	"	38-45
WIA	"	46-52
GA	"	53-54

INDEX-II

YEARWISE LIST OF COMPLETED PROJECTS
UNDER BDB.

<u>Year</u>	<u>No. of Projects completed</u>	<u>Year</u>	<u>No. of Projects completed.</u>	<u>Year</u>	<u>No. of projects completed</u>
1944-45	-	1960-61	-	1976-77	-
1945-46	4	1961-62	4	1977-78	16
1946-47	3	1962-63	3	1978-79	24
1947-48	2	1963-64	8	1979-80	15
1948-49	0	1964-65	4	1980-81	22
1949-50	0	1965-66	11	1981-82	29
1950-51	2	1966-67	25	1982-83	41
1951-52	1	1967-68	23	1983-84	57
1952-53	0	1968-69	11	1984-85	16
1953-54	0	1969-70	6	1985-86	10
1954-55	1	1970-71	2	1986-87	7
1955-56	2	1971-72	9	1987-88	4
1956-57	3	1972-73	8	1988-89	12
1957-58	4	1973-74	2	1989-90	15
1958-59	3	1974-75	1	1990-91	9
1959-60	7	1975-76	1	-	15
	5		5		

Total No. of projects completed upto June/91 = 452