CHAPTER 7

IMPLEMENTATION PLAN

CHAPTER 7 IMPLEMENTATION PLAN

7-1. Organization for Project implementation

As for the project execution, the BWDB is to be the principal implementation agency. The BWDB is responsible for planning and implementing irrigation, drainage and flood control projects and for operation and maintenance of the completed projects.

It is proposed that an organization be established in the BWDB as shown in Fig.7-1 and 7-2 to execute Kurigram Irrigation and Flood Control Project -North Unit. Under Chief Engineer Project IV, Rangpur, a circle headed by a superintending engineer will be set up at the project site.

Various ministries and organizations will be involved in the project. The DAE of the Ministry of Agriculture is responsible for agricultural extension. The BADC for supply of agricultural materials. The BRDB for organization of cooperatives. Upazilas have local governments, headed by elected chairmen and staffed by officers from central ministries and organizations, which are responsible for upazila level administration and development.

For the smooth and successful project implementation, it is recommended that coordination committees be organized at both central and local levels. The central committee will mainly coordinate the activities of organizations concerned to formulate appropriate schemes and to advise on the program activities. The local committee will coordinate the activities of local level organizations concerned such as local agencies, local governments and farmers' associations in order to promote on-farm development, improved farming and appropriate water management.

7-2. Financing

The foreign currency portion of the project cost will be financed by an international or foreign financing institute, while the local currency portion will be provided by the Bangladesh Government.

Fig. 7-1 Proposed Organization Chart of Implementation for the Kurigram Irrigation and Flood Control Project

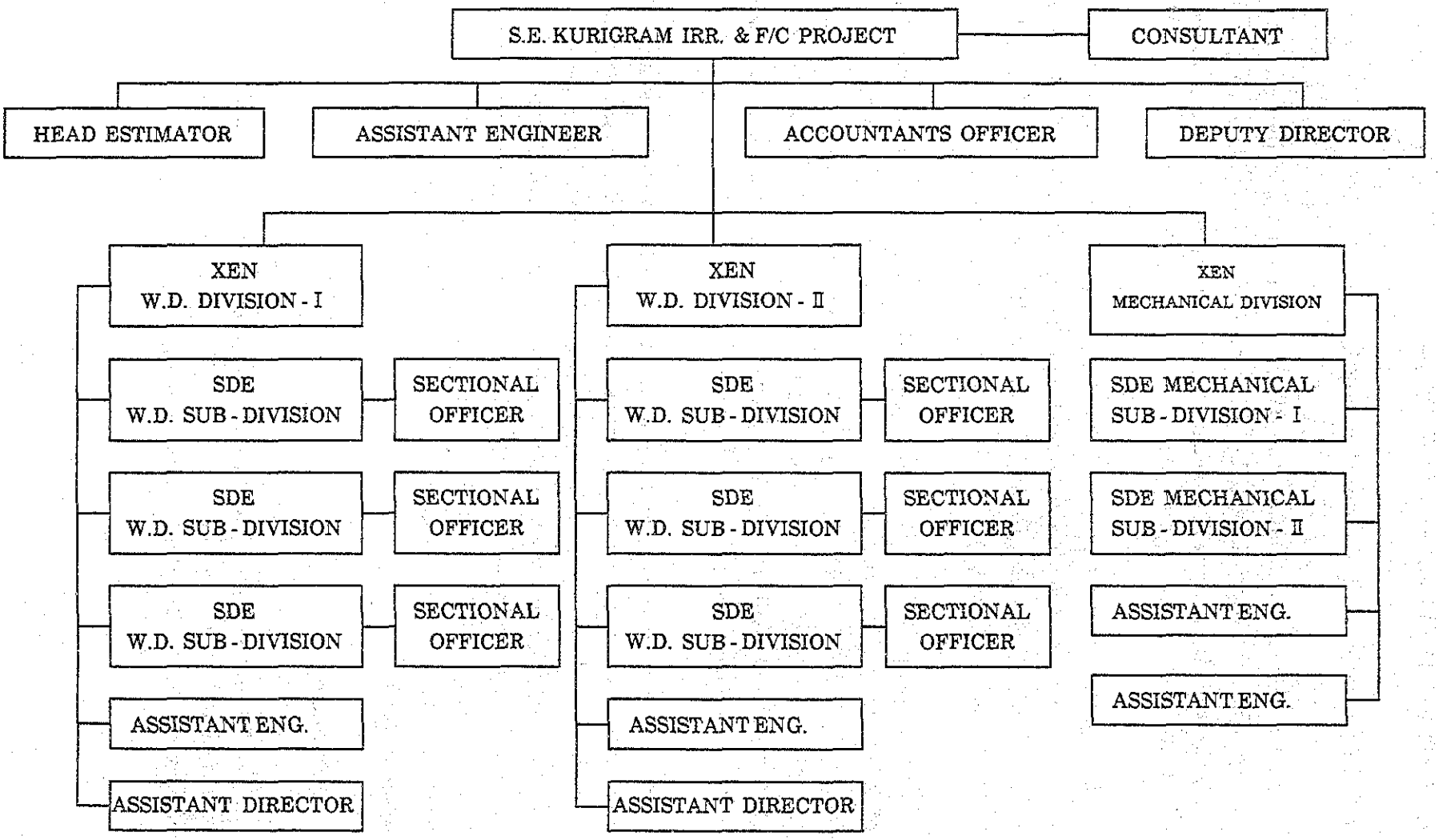
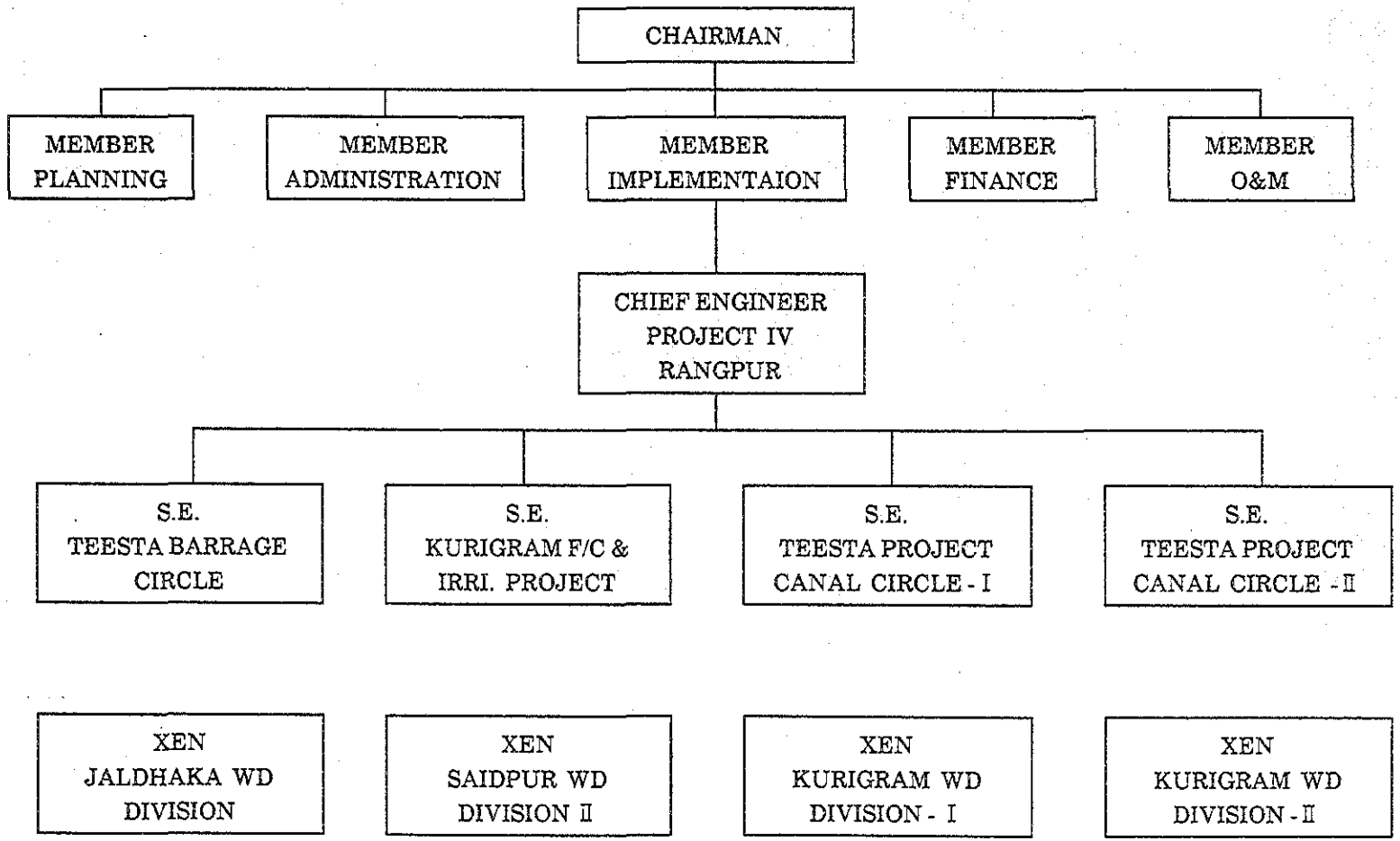


Fig. 7-2 Structure of BWDB for Kurigram Irrigation and Flood Control Project



Note; S.E --- SUPERINTENDING ENGINEER
XEN --- EXECUTIVE ENGINEER
SDE --- SUB - DIVISIONAL ENGINEER

7-3. Construction Mode

A qualified contractor for the civil works of the project will be selected by a local competitive bidding. For supply of construction machinery and pump equipments, on the other hand, a qualified contractor will be selected by an international competitive bidding.

7-4. Implementation Schedule

Detailed design for the project will take one year including topographical and geological surveys. Loan procedure and tendering will take 8 months.

With regard to the irrigation system, the works for Pateswari pump area will be started at first. Afterwards, the works for Tangonmari pump station will be executed.

With regard to the flood embankment and drainage facilities, the embankment and regulators will first be started, and later Begomganj drainage pump station will be constructed.

Since the project cost is considerably large, the project implementation might be divided into two stages as shown in the following Table 7-1.

Table 7-1 Alternative Two-stage Investment Plan

Items	First stage	Second stage
Scope of works		
Irrigation system	Pateswari Pump, The system portion commanded by Nageswari Main Canal	The system portion commanded by Fulbari Main Canal,Tangonmari Pump
Irrigated area	17,720 ha	15,080 ha (Fulbari 11,730 ha, Tangonmari 3,350ha)
Flood embankment	Whole	-
Drainage system	Regulators	Begomganj Pump
Cost(Million Tk)	2,034	1,227

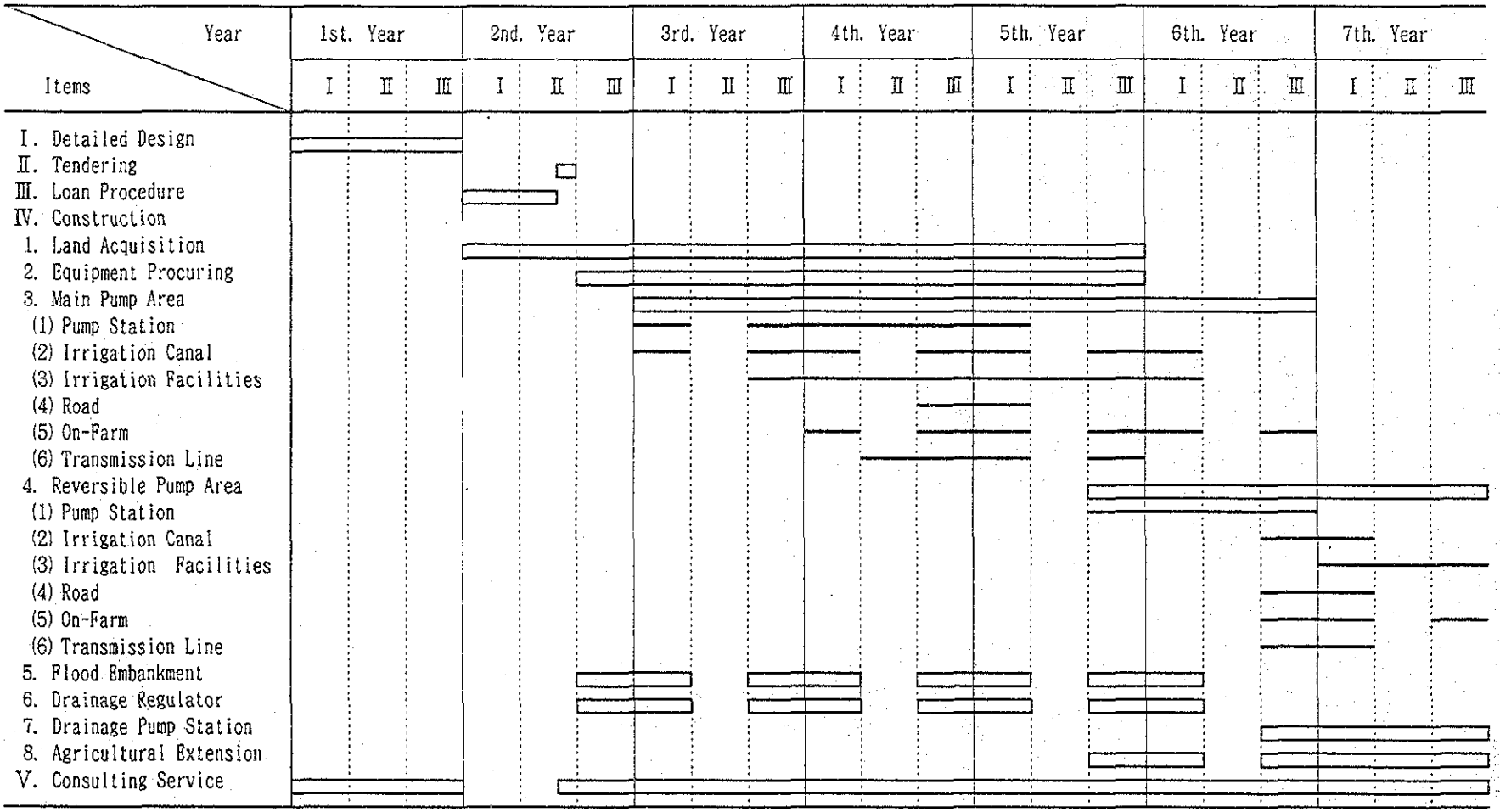


Fig. 7-3 Project Implementation Schedule

CHAPTER 8

OPERATION AND MAINTENANCE PLAN

CHAPTER 8 OPERATION AND MAINTENANCE PLAN

8-1. Operation and Maintenance Works

Operation and Maintenance Works are comprised of the following items.

(a) Pump stations

- Operation of pumps.
- Maintenance of machinery and electrical equipment.
- Dredging for inlet basins, head race canals and settling basins: Dredging is to be done for inlet basins and head races at the beginning of the dry period by using potable sand pumps (150 mm bore, 11 kw), of which 2 sets will be equipped for each of Pateswari and Tangonmari stations and 1 set for Begongon Station. Settling basins will be dredged by bulldozers and/or manual labor.

(b) Canals and Embankments

- Operation of division gates, check gates and regulator gates.
- Maintenance of earth works and structures.

(c) Communication system

A wireless telephone system will be installed for operation.

8-2. Organization for Operation and Maintenance

The BWDB will be responsible for the operation and maintenance of the irrigation system, the drainage system and flood embankment completed by the project. It is proposed that the BWDB establish an organization for operation and maintenance as shown in Fig. 8-1.

8-3. Irrigators' Association

Farmers who get benefit from this project have to construct farm ditches to introduce irrigation water from tertiary canals into farm. Efficient distribution of irrigation water can not be obtained until farm ditches are completed appropriately. Moreover, inadequate operation and maintenance of the irrigation system (from main facilities to farm ditches) completed by the project not only will greatly undermine the effectiveness of this project, but also will often lead to destruction of the facilities. Accordingly, it is necessary to establish an irrigators' association which holds organizational ability and potential funds to construct and maintain farm ditches appropriately and manage irrigation water efficiently.

As a farmers' association for irrigation management, it might be considered to establish an organization under the UCCA/KSS/BSS/MBSS system, which has been carrying out various economic activities, supplying the funds for those activities. Actually, under this system, there are cooperatives set up mainly for irrigation management of tube wells. However, an UCCA/KSS/BSS/MBSS system is organized by grouping farmers by their economical conditions basically corresponding to administrative organization, while an irrigators' association in this Project is to be composed of all the beneficiaries of the irrigation system and to be organized corresponding to the composition of the irrigation system which is made without any relation to administrative boundaries. Therefore, it does not seem to be suitable to establish the irrigators' association under the UCCA/KSS/BSS/MBSS system. For example, in G.K. Project of the BWDB, the unification of both associations was tried, but that ended in failure.

Considering setting up of the proposed irrigation system, it is proposed that the irrigators' association will be organized through the following steps:

① A water users' group at the lowest level, called "an outlet water association" will be composed of a group of beneficiaries (around 5 farmers) of approximately 5 ha of land which is covered by irrigation water through a farm ditch from a tertiary outlet.

② Six water users' groups of farm ditch level will form a group of tertiary canal level with an area of approximately 30 ha covered by a turn-out of a secondary (lateral) canal, roughly corresponding to 30 farmers. In a precedent project of the BWDB (G.K.Project), outlet water associations covered by one tertiary canal have

formed a federate irrigators' association, that is an uppermost organization of water users' groups. Accordingly, also, in this Project, irrigators' associations of up to tertiary canal level are to be first formed.

③ Next, some water users' groups of tertiary canal level are to form a group covered by one secondary (lateral) canal.

④ Similarly, water users' groups of main canal level will be formed.

⑤ Finally, a unified federate irrigators' association for the whole area in this Project is to be formed. This association will deal with the common issues of all beneficiaries regarding water management, including training and guidance for appropriate operation and maintenance of farm ditches and collection of water charge, in collaboration with the BWDB.

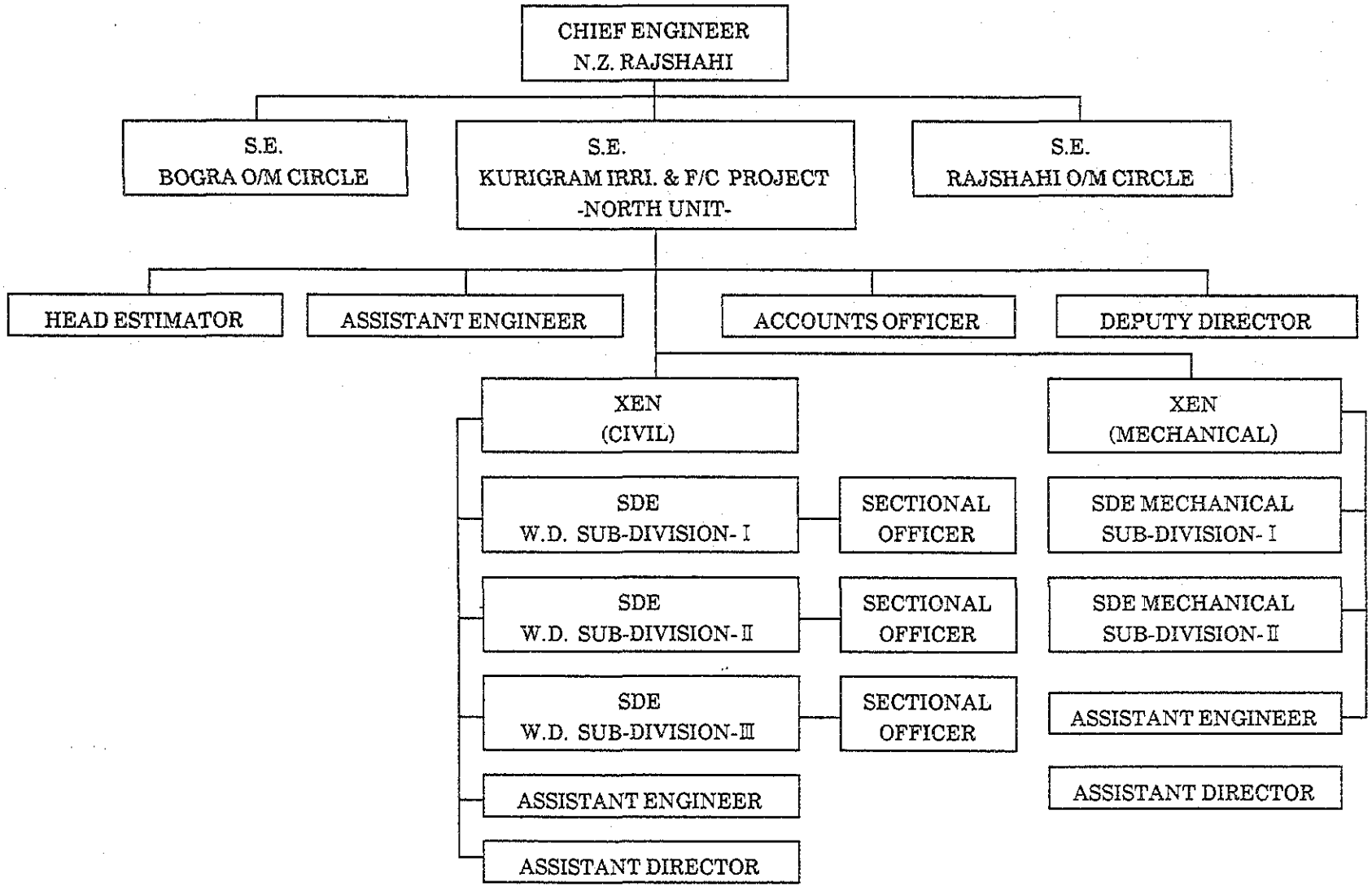
As mentioned in the above ②, at the first stage, federate irrigators' associations of tertiary canal level, which cover approximately 30 hectares responding to some 30 farmers and consist of about 6 outlet associaitions each. The organization and responsibilities of this irrigators' association of tertiary canal level will be as follows :

- Purposes; To conduct appropriate operation and maintenance of the irrigation system (mainly from the on-farm level upto the tertiary level) in cooperation with and under the control of the BWDB.
- Activities ;
  - ① To plan water distribution based on demands from the association members.
  - ② To conduct maintenance and repair works of on-farm level irrgation facilities.
  - ③ To formulate reports for irrigation practices.
  - ④ To collect water charges.
- Organization ;
  - ① A chairman elected among the association members represents the association and presides the bellow-mentioned managing committee.
  - ② A managing committee is set up for management. The committee is comprized of the chairman and representatives (one each) of the

concerned outlet associations. The committee members share the responsibilities (abministration, accountancy, maintenance, water distribution, water charge collection,etc.) of the association.

③ A secretary-general is employed.

Fig. 8-1 Proposed Organization Chart of Operation and Maintenace for the Project



CHAPTER 9

PROJECT JUSTIFICATION

CHAPTER 9 PROJECT JUSTIFICATION

9-1. General

The objective of the project is to address the national requirement for contributing to the programme of self-sufficiency for food, the creation of additional employment opportunities and the ultimate reduction of porverty through accelerated development activities in the rural economy. The project purports to provide flood control and drainage to 42,800 ha. and irrigation to 32,800 ha. of land to reap the above benefits in terms of increased food production, avenue of employment and elevated living standards for the project populace.

It is envisaged that the project area may attain an amount of development even without the project. For example, variables like crop yields, labour requirement, other input uses, crop intensity, cropping patterns etc. are likely to improve in the course of time. However, the proposed project activities would bring about a productive environment where the pace of development for these target variables are expected to be accelerated with the project.

The project will be evaluated by comparing the values of those variables under with-project situation against those of without-project situation. Surface water irrigation facilities with pumps and canals, coupled with the reduced level of flooding due to flood control and drainage work would induce the present level of cropping intensity from 177% to 244%. The value of other variables have been presented in this Final Report.

The evaluation of this project is proposed to be accomplished as per the widely accepted theory developed by Little and Mirrless. It is simply a cost-benefit analysis based on market prices for financial analysis and on efficiency prices for economic analysis. The former would reveal the attractiveness to the individual farming units (Private) and the latter would justify the Project for the national economy as a whole (Social).

In this procedure of the project evaluation, financial analysis and economic analysis will be carried out at the same time and then a sensitivity analysis will be taken to test the project's resilience to the possible risky variables.

9-2. Project Cost Estimation

Depending on the cost estimation noted in former chapter, investment costs and annual operating/recurring expenditure for the project are calculated in both financial and economic categories. They are shown below in Table 9-1, and Table 9-2.

(a) Investment Cost for the Project

The direct cost of the project consist, mainly, of the following items:

-Direct construction cost for pumping stations, irrigation canals, irrigation and drainage facilities, access roads, on farm facilities and transmission lines.
-Cost for land acquisition and compensation
-Expenses for engineering services including transport vehicles
-Administration expenses including agricultural extension sevices
-Consulting services

And a 10% physical contingency element has been included in the costings for civil work, pumping stations, vehicules and equipment. On the other hand a price contingency is estimated by using the World Bank inflation rate projection as

year	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.
Local cost	0	0.1	0.19	0.27	0.36	0.45	0.56
Foreign cost	0	0.07	0.12	0.17	0.22	0.27	0.33

The Sunk cost of the existing irrigation facilities in the project area had been omitted, because their life span would expire in course of the project construction.

While financial costs of the project are counted based on market prices, economic costs are valued with economic prices or accounting prices i.e. border prices for trade commodities and conversion factors. However, economic costs should exclude, of course, transfer items like import tax, financial interest, land tax, water charges, subsidies, imputed capital costs and expenses for land acquisition. The conversion factor used to obtain economic prices for non-traded

commoditied is 0.82, and 75% of market wages was used as the opportunity costs of unskilled labour.

Table 9-1 illustrates the financial investment cost of 3,261.2 million Taka and the economic one at 2,497.3 million, in which the real cost was 2,463 and 1,878 million Taka respectively.

(b) Operation/Recurring Project Costs

Operation/Recurring expenditures for the project implementation are shown in Table 9-2 on an annual base. The total expenses were estimated at 80 million T.K. as a financial base and 63 million T.K. as an economic base. It's major components are electricity and manpower.

Table 9-1 Project Investment Costs

Items	Financial (million T.K.)				Economic (million T.K.)		
	Local	Foreign	Tax	Total	Local	Foreign	Total
Land acquisition	146.7	-	-	146.7	-	-	-
Construction cost							
Pumping station	241.2	685.0	260.8	1,187.0	195.1	685.0	880.1
Irrigation canal	146.6	-	-	146.6	100.3	-	100.3
Irrigation facilities	190.9	74.7	-	265.6	155.0	74.7	229.7
Drainage facilities	88.9	24.4	-	113.3	73.0	24.4	97.4
Road construction	8.1	-	-	8.1	6.5	-	6.5
On-farm facilities	105.3	14.1		119.4	80.6	14.1	94.7
Transmission line	4.8	17.5	8.0	30.3	3.9	17.5	21.4
Associated costs							
Constrution machinery	3.2	57.3	27.5	88.0	2.6	57.3	59.9
Agricultural extension	12.8	6.6	1.9	21.2	10.1	6.6	16.7
Administration cost	88.0	11.5	1.6	101.1	72.1	11.5	83.6
Consulting services	36.6	199.2	-	235.8	30.0	199.2	229.2
Total cost	1,072.9	1,090.5	299.8	2,463.2	787.7	1,090.3	1,878.0
Physical contingency				195.8			154.9
Price contingency				602.2			464.4
Grand total				3,261.2			2,497.3

Source: Table 6-1 Project Cost, However, economic figure are accounted from finances by using a conversion factor, reducing transfer items, such as land acquisition, import tax, domestic duty, subsidies, interest etc. SCF in Bangladesh is 0.82 and SP for unskilled labor charge is 75% of their market price.

Table 9-2 Annual Operating/Recuring Project Expenditures

Items	Financial (million T.K.)				Economic (million T.K.)		
	Local	Foreign	Tax	Total	Local	Foreign	Total
Raw material and supplies	5.73	3.82	1.91	11.46	4.70	3.82	8.52
Electricity	47.00	-	1.91	48.91	38.54	-	38.54
Fuel	0.19	-	0.02	0.21	0.15	-	0.15
Man power	15.19	-	-	15.19	12.30	-	12.30
Vehicle repair and maintenance	0.41	0.27	0.14	0.82	0.34	0.27	0.61
Miscellaneous	3.60	-	-	3.60	2.95	-	2.95
Total	72.12	4.09	3.98	80.19	58.98	4.09	63.07

Source: Table 6-3.

Remark: The Same as the above table.

9-3. Project Benefit Estimation

It is pointed out that the major component for the project benefit is an increased crop production in the Kharif and the Rabi season for each year. The component of crop-related benefit in fisheries and livestock would also accrue to benefits due to the irrigation and flood control investment in the project associated with other private or public sector investments. However, in this project the evaluation of fish and livestock's benefits were not counted due to a lack of data. In the project evaluation, tangible and direct benefits take the load in employment. And indirect or untangible benefits are not taken into calculation.

The estimation of the project benefits were done as net production values with project and without project on the financial side and on the economic side respectively. Financial benefits were calculated by market prices, while the economic one was with the accounting prices derived from border prices and conversion factors. The following table illustrates the market prices and economic prices used for benefit calculation.

Tabel 9-3 Market Price and Economic Price for Project Benefit Calculations

Out put	Market or financial price TK/kg	Accounting (Economics) price TK/kg
B. Aus. local	5.83	6.10
T. Aman HYV	5.47	6.10
B. Aman local	5.83	6.10
T. Aman local	5.83	6.10
T. Aman pajam	5.47	6.10
T. Aman HYV	5.47	6.10
Boro HYV	5.47	6.10
T. Aus/Boro local	5.83	6.10
Aus Aman mixed	5.83	6.10
Jute local	5.00	9.20
Jute HYV	5.50	9.20
Masterd	11.50	9.43
Kaun	7.00	5.74
Wheat local	4.80	7.00
Wheat HYV	5.30	7.00
Potato	2.50	2.10
Sweet potato	1.50	1.38
Summer vegetables	2.00	1.64
Winter vegetables	2.00	1.64
Pulses	11.00	9.00
Khesari	11.00	9.02
Mungbeen	15.00	12.30
Fordermaise	0.10	0.08
Dhaincha	0.10	0.08

Out put	Market or financial price TK/kg	Accounting (Economics) price TK/kg
Urea	4.8	3.5
T.S.P.	5.0	7.4
M.P.	4.0	5.5
Manure	0.2	0.16
Labour man / day	24.0	19.68
Bullock per hour	6.0	4.92

Source: Market price Farm gate prices in the project area obtained from field survey 1989.

Economic prices of paddy, wheat, jute, urea, TSP and MP are boarder prices.

Economic prices of other crops, manure, labour and bullock are calculated with conversion factor of 0.82.

The procedure for the calculation of production value and inputs for cultiviation has been indicated in appendix X from Table 5 to 11. And they are summarized in the following Table.

Table 9-4 Summary of Benefit Computation
(Thousand T.K.)

	Financial	Economic
A. Without-project condition :		
1. Gross production value	713,208	774,682
① Gross crop production	639,087	713,902
② Gross by-products	74,121	60,780
2. Inputs for cultivation	648,744	330,672
3. Net benefit	64,464	444,010
B. With-project condition		
1. Gross production value	1,547,489	1,647,543
① Gross crop production	1,396,052	1,523,364
② Gross by-products	151,437	124,179
2. Inputs for cultivation	1,027,826	551,870
3. Net benefit	519,663	1,095,673
C. Net incremental benefits	455,199	651,663

Under with-project conditions the net benefit is estimated as 519,663 thousand T.K. on a financial base and 1,095,673 thousand on an economic base, while in the without-project conditions, they were 64,464 thousand T.K. and 444,010 thousand T.K. And the net incremental benefit of this project can be estimated as 455,199 thousand T.K. for financial basis and 651,663 thousand T.K. for economic basis every year. There is also the contribution of incremental benefit with by-products value.

9-4. Project Justification

(a) Financial and Economic Analyses of the Project

In order to calculate FIRR, EIRR, NPV and BCR of the project, a 30 year plan horizon was assumed for analysis. It was broadly divided into two years of detailed engineering, five years for construction and twenty three years for full operation. In view of the nature of civil work no residual value is assumed at the end of the discounted period.

The project implementation schedule and annual distribution investment are used in the analysis (see next Table 9-5).

Table 9-5 Annual Distribution Investment cost in the Project.

(Financial) million T.K.

	Local	Foreign	Physical contingency	Price escalation	Total
1st year	17.56	55.67	-	-	73.23
2nd year	69.72	121.33	10.32	16.23	217.60
3ird year	187.30	355.12	46.32	84.69	673.43
4th year	303.19	404.15	62.82	163.73	933.89
5th year	271.84	341.36	53.05	187.64	853.89
6th year	163.28	71.71	18.54	100.39	353.92
7th year	59.99	40.97	4.78	49.51	155.25
Total	1,072.88	1,390.31	195.83	602.19	3,261.21

(Economic) million T.K.

	Local	Foreign	Physical contingency	Price escalation	Total
1st year	14.35	55.67	-	-	70.02
2nd year	27.47	92.18	7.33	9.75	136.74
3ird year	128.12	264.43	35.32	57.11	484.98
4th year	227.42	309.47	49.76	124.60	711.25
5th year	200.74	257.59	41.62	140.87	640.82
6th year	138.87	71.08	16.51	88.32	314.80
7th year	50.73	40.04	4.31	43.76	138.84
Total	787.70	1,090.46	154.85	464.41	2,497.46

Source: Project cost estimation.

On the other hand, operating/recurring cost and net benefits (with-without) will be distributed as follows.

year	from 1st to 4th	5th	6th	7th	8th	9th …·
O/R cost	0%	33%	61%	89%	100%	100%
Net, Benefit	0%	30%	60%	90%	100%	100%

Those % are estimated from the implementation schedule of the project.

Through both, financial and economic analyses, the following indicators are obtained.

	Financial Indicator (million T.K.)	Economic Indicator (million T.K.)
① Net Production Value (15% discount rate)	△659.82	456.47
② Benefit Cost Ratio		
(10% discount rate)	0.953	1.785
(15% discount rate)	0.685	1.286
③ Internal Rate of Return	9.6%	19.7%

△……minus

(b) Sensitivity Analysis

In order to test the project's resilience to possible risky variables, three sensitivity analysis were carried out:
① 10% of the project costs increase due to unforeseen natural conditions and unexpected increase of material costs, ② 10% of the project benefits decrease due to the unexpected fall of output prices and decreased yields, and ③ a cost increase due to a two years'run of construction, operation and management and agricultural extension services.

Sensitivity indicators for each case obtained are as follows:

Case one	18.4%
Case two	18.3%
Case three	19.8%

(c) Project Justification

It can be ascertained from the previous section (a) that the economic internal rate of return is 19.7%, over the 15% opportunity costs of capital in Bangladesh, and the benefit cost ratio with a discount rate of 15% is 1.286, while the financial analysis indicators seem to be rather low and unefficient. Fathermore sensitivity indicators are not unstable. Therefore the irrigation and flood control project for Krigram north unit is feasibile and appears to be economically justifiable .

9-5. Socio - Economic Impact of the Project

(a) Various secondary and intangible benefits and/or favorable socio-economic impacts are expected from the implementation of the project, in which the most important event is the increase of employment opportunities in the project area.

According to the cost estimation, labour requirements for the investment of the project counted at 7,403 thousand man-days during the years of implementation, of which 74% are unskilled labour. Beside, the annual labour requirements for operation and maintenance of the project is estimated about 334 thousand man-days, of which 77% is semiskilled labour.

On the other hand agricultural labour requirements for crop cultivation is estimated as with-project and without-project conditions. The difference is counted at 4,086 thousand man-days every year. In the new cropping patern, November, March, and July require large amounts of additional agricultural labour as can be seen it in the following Table 9-6.

Table 9-6 Labour Requirements for the Project for Investment (man-day)

	Total	Manage rial	skilled	unskilled
Pump station	697,500	5,400	282,000	410,100
Irrigation canal	3,617,000	23,000	364,000	3,230,000
Irrigation facilities	468,700	3,400	212,000	253,300
Drainage facilities	717,300	4,600	126,000	586,700
Road Construction	39,700	400	16,000	23,300
On farm	1,312,700	-	376,000	936,700
Transmission line	7,300	-	4,000	3,300
Construction Machine	36,900	4,900	32,000	-
Agricultural Extension	91,600	-	44,000	47,600
Administration	414,000	56,000	358,000	
Total	7,402,700	97,700	1,814,000	5,491,000

Source: Project cost estimation

Monthly Labour Requirements for Crop Cultivation

month	with	without	difference
Jan.	548,000	283,000	265,000
Feb.	1,246,000	774,000	472,000
March	1,756,000	1,096,000	660,000
Aprir	769,000	343,000	426,000
May	318,000	347,000	△29,000
June	1,251,000	940,000	311,000
July	1,992,000	1,463,000	529,000
Aug.	832,000	776,000	56,000
Sept.	614,000	498,000	116,000
Oct.	365,000	198,000	167,000
Nov.	1,745,000	900,000	845,000
Oct.	932,000	664,000	268,000
Total	12,368,000	8,282,000	4,086,000

△; minus

Source: Appendix Table X-13 and X-14

(b) The following socio-economic impacts are also expected in the project area and Bangladesh.

- Improvement of insufficient nutrition and poverty elimination
- Sanitation improvement.
- Improved communications and transport resulting from infrastructural development.
- Induced capital investment, borth public and private, in rapidly developing areas caused by this project.
- Increase income in the marketing and processing of farm-products resulting from indirect repercussions of the project.
- Increased production and marketing of farm inputs like seeds and fertilizer.
- Effect on the balance of payment either through import substitution.
- Development of women's activities.
- Transfer of technology.

While these secondary benefits have not been formally included in the economic analysis, there is no doubt that they will make a very significant contribution to the social and economic development inside and outside the project area.