ANNEX - IX

PROJECT ORGANIZATION AND MANAGEMENT

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PROJECT ORGANIZATION AND MANAGEMENT

1. PROPOSED ORGANIZATION

1.1 Organization in Construction Stage

In order to implement the Project successfully, it is proposed to establish the Project Construction Office under the superintendence of the Provincial Public Works. The proposed organization structure is shown in Fig. IX-1. Main functions of the Project Construction Office are as follows:

(1) financial arrangement needed for construction of irrigation and road networks, and operation and maintenance of project facilities,

(2) design and construction supervision of all the construction activities down to tertiary system,

(3) assistance to farmers in construction of quaternary system,

(4) planning, design, construction supervision and operation of a pilot demonstration scheme, and

(5) accounting and management of construciton works.

The Project Construction Office will consist of one main office and four branch offices. It is proposed to organize and construct the main office at Rangkasbitung before getting into the major construction works of the Project. The branch offices will be constructed at Gadeg, Kopo, Pamarayan and Cikande in keeping with the progress of the project construction works.

The Project Office will have two working divisions; technical divison and administrative division. The technical division will be responsible for all the engineering matters relating to construction of the project facilities. This division will consist of four sections of design, construciton, operation and workshop.

The administrative division will be responsible for accounting, financing, administrative affairs and procurement for the implementatin, operation and maintenance of the project. This division will consist of four sections; accounting, financing, personnel management and store sections.

1.2 Organization in O & M Stage

After completion of the project construction works, the Project Construction Office will be re-organized into the Project Operation and Maintenance Office under the same provincial Public Works Service. The Project O & M Office will be responsible for operation and maintenance of the irrigation and road networks down to inlets of tertiary blocks. The operation and maintenance of the tertiary blocks down to the terminal facilities will be entrusted to the farmers' associations and farmers themselves. The organization of the Project O & M Office is shown in Fig. IX-2.

The Office will consist of one head office at Rangkasbitung and four sub-offices. All the main and branch offices established in the construction stage will be used as the Project O & M main office and sub-offices after completion of the construction work. The main office will consist of two divisions such as administrative division and technical division. The administrative division will consist of four sections, i.e. Accounting Section, Finance Section, Personnel Section and Store Section. The technical division will consist of four working sections such as the Design Section, Operation Section, Maintenance Section and Mechanical Section.

The main office will be responsible for the overall activities necessary for proper operation and maintenance of all the project facilities including preparation of overall O & M program, design and construciton/supervision of maintenance works, budgeting, training of staff, etc.

Each section of the main office will have the following duties and tasks:

Design Section

(1) survey, planning and design of the maintenance works,

(2) assistance and advice to farmers' organizations in design of maintenance works of tertiary canals to the terminal facilities, and

(3) collection and analysis of data on the rivers discharge.

Operation Section

(1) estimation of water requirements and preparation of water supply schedule based on the cropping schedule obtained from the water users' association through the sub-offices.

(2) regular contact with sub-offices regarding water supply schedule, and

(3) supply of information on water supply management to the sub-offices.

Maintenance Section

(1) periodical and routine inspection,

(2) preparation of the program for routine and periodical maintenance and emergency repair,

(3) tender for repair works and supervision of the works, and

(4) Assistance and advice to water users' association in maintenance works of tertiary canals down to terminal facilities.

Mechanical Section

(1) manangement of workshop and O & M equipment,

(2) preparation of operation schedule of O & M equipment,

(3) repair and maintenance of metal works of the project facilities.

As mentioned above, sub-offices will be established in the project area. The sub-offices will have four field offices (Resorts), which are terminal field offices of the Porject O & M Office. The duties of the sub-offices are as follows:

(1) collection of information of cropping schedule from the water users' associations and transfer it to the main office,

(2) supply of information on water supply schedule to the water users' association,

(3) gate operation according to the water supply schedule prepared by the main office, and

(5) providing periodical consultation to water users' association on operation and maintenance of tertiary canals down to terminal facilities.

The commanding areas, facilities and Kecamatan concerned to the sub-offices are as follows:

Sub-Office	Main Facilities	Commanding area	Kecamatan Concerned
Gadeg	Diversion dam Intake gate Spill way	Area directly commanded by Headrace	
Kopo	Upper reaches of Main Canal	South eastern part of Project area	Kopo
Pamarayan	Lower reaches of Main Canal	Western part of Project area	Pamarayan
Cikande	Lower reaches of Main Canal	Northern part of Project area	Cikande

2. STAFFING AND EXPATRIATE ASSISTANCE

Number of staff required in the Project office is estimated paying due attention to the working quantities, implementation method and schedule, and number of tertiary irrigation block based on the similar projects. Staff needed will have to be increased with the progress of the Project work. Total number of staff required in the construction stage is estimated to be 82 at maximum, which include administrative staffs, engineers, experts and field attendants.

Required number of the staff in the full operation stage of the Project will be 58. In addition, considerable number of seasonal employees will be required for the maintenance works. The staffs required during the construction and operation and maintenance stages are shown in Table IX-1 and IX-2 with their specialities.

To cope with severe shortage of experienced personnel in Indonesia, some specialists would have to be engaged from abroad throughout the design and construction stages. The required number of the experts to be invited for both stages are shown in Table IX-3 and IX-4.

3. WATER USERS' ASSOCIATION

Operation and maintenance of the facilities in the tertiary block will be carried out by farmers themselves. Before completion of the construction works of the project facilities, the water users' association should be established under the initiation of each village chief, Camat and Bupati with strong guidance of and consultation with the Project O & M Office and agricultural office. In general, a water users' association will be organized in each village unit consisting of several tertiary blocks. The typical organization chart is shown in Fig. IX-3.

In order to ensure proper water management by the water users' association, Bupati, Camat and village chief will assist and supervise all the activities of the association at their respective levels. The activities of the association will further be supported by the Kabupaten Irrigation Committee, the Project office, the Kecamatan Irrigation Section (SEKSI) and the village unit. In particular, the Project office will provide full technical guidance and advice in water supply management and maintenance and improvement of the facilities in the tertiary block through the Resorts of the O & M sub-office.

The water users' association will have a board which consists of a chairman, treasurer and farmers' representatives. The chairman of the board elected from and by the members will manage the association. The treasurer will be responsible for financial administration. Ulu-ulu/1 will carry out water management in the tertiary block, such as preparation of irrigation calendar, handling of canal structures, diverting of scheduled amount of water to the quaternary canals, and supervision of maintenance works, etc. For the assistant of Ulu-ulu, the farmers' leaders will be engaged in water management.

The activities of Ulu-ulu and the farmers' leaders are important for proper water management at farm level and for the project as well. They are required to have a certain technical knowledge for water supply management of the project as well as at farm level. They will therefore be trained by the staff of the Project office.

/1: Ulu-ulu: the village irrigation officials

Table IX-1

REQUIRED NUMBER OF PROJECT STAFF IN CONSTRUCTION STAGE

Project Staff	Year 1984	1985	1986	1987
Project Office				
Project Manager	1	1	1	1
Clerk	1	1	1	1
	1	1	1	1
	2	2	2	2
Engineering Division				
Civil Eng.	1	1	1	1
Clerk/typist	1	1	1	1
	2	2	2	2
Design-Section				
Irrigation Eng.	1	1	1	1
Design Eng.	4	4	2	2
Junior Design Eng.	8	8	4	4
Surveyor	4	4	2	2
Draftsman	8	8	4	4
Typist	1	1	1	1
	26	26	14	14
Construction Section				
Civil Eng.	1	1	1	1
Construction Eng.	1	2	4	4
Mechanical Eng.	1	1	1	1
Electrical Eng.	0	0	1	1
Building Eng.	0	1	0	1
Field Supervisor	1	3	6	6
Draftsman	1	1	2	2
Typist	1	1	1	1
	5	10	16	16
Workshop Section				
Mechanical Eng.	1	1	1	1
Mechanic	0	1	1	1
Electrician	0	1	1	1
Operator	0	0	0	1
Driver	1	3	3	3
Typist	1	1	1	1
	2	6	8	8

Project Staff	Year 1984	1985	1986	1987
Operation Section				
Water Officer	0	0	0	1
Assist. Water Off.	0	0	0	2
Typist	0	0	0	1
	0	0	0	4
Sub-total	37	46	42	44
Administrative Division				
Administrative Officer	1	1	1	1
Clerk	1	1	1	1
Accounting Section				
Accountant	1	1	1	1
Others	1	1	1	1
Finance Section				
Finance Officer	1	1	1	1
Others	1	1	1	1
Personnel Section				
Personnel Management Off.	1	1	1	1
Others	1	1	1	1
Store Section				
Store Keeper	1	1	1	1
Others	1	1	1	1
Sub-total	10	10	10	10
Sub-office and Resort				
Chief	0	0	0	4
Officer	0	0	0	4
Waterman (PP Air)	0	0	0	20
Sub-total	0	0	0	28
Total	47	56	52	82

Table IX-2

REQUIRED NUMBER OF PROJECT STAFF IN O & M STAGE

Project Staff	No. of Personnel
1. Project Office	2
(1) Project Manager	1
(2) Secretary/Typist	1
2. Administrative Divison	8
(1) Administrative Officer (Chief)	1
(2) Accountant	1
(3) Cashier	1
(4) Finance Officer	1
(5) Personnel Officer	1
(6) Clerks/Typists	2
(7) Store Keeper	1
3. Technical Division	16
(1) Civil Engineer (Chief)	1
(2) Irrigation Engineer	1
(3) Design Engineer	1
(4) Construction Engineer	1
(5) Field Supervisor	1
(6) Mechanical Engineer	1
(7) Mechanic	1
(8) Electrician	1
(9) Operator	2
(10) Driver	3
(11) Water Officer	1
(12) Assist. Water Officer	1
(13) Clerks/Typists	1
4. Sub-Office	28
(1) Sub-office Chief	4
(2) Officer	6
(3) Waterman	18
Total	54

Table IX-3 REQUIRED NUMBER OF FOREIGN CONSULTANTS

(Detailed Design Stage)

	Speciality	Number of Personnel
1.	Project Director	1
2.	Team Leader	1
3.	Irrigation Planning Engineer	1
4.	Irrigation Design Engineer (including fill dam design Eng.)	2
5.	Civil Engineer	1
6.	Quantity Surveyor	1
7.	Hydraulic Structural Engineer	1
8.	Hydrologist	1
9.	Geologist	1
10.	Soil Mechanical Engineer	1
11.	Mechanical Engineer	1
12.	Construction Planner	1
13.	Topographic Surveyor	1
14.	Other Specialists as required	L.S.

Table IX-4 REQUIRED NUMBER OF FOREIGN CONSULTANTS

(Construction Stage)

	Speciality	Number of Personnel: Diversion works & canals	Number of Personnel: Tertiary Develop.
1.	Project Director	1	-
2.	Team Leader	1	-
3.	Construction Engineer	2	1
4.	Irrigation Engineer	1	1
5.	Design Engineer	1	-
6.	On-farm Design Engineer	1	1
7.	Equipment Engineer	1	-
8.	Quantity Measurement Engineer	1	-
9.	Metal Work Engineer	1	-
10.	Soil Mechanical Engineer	1	-
11.	Foundation Engineer	1	-
12.	Procurement Engineer	1	-
13.	Topographic Surveyor	-	1
14.	Guidance Engineer	1	-
15.	Other Specialists as required	L.S.	L.S.

Fig.IX-1

ORGANIZATION OF PROJECT CONSTRUCTION OFFICE

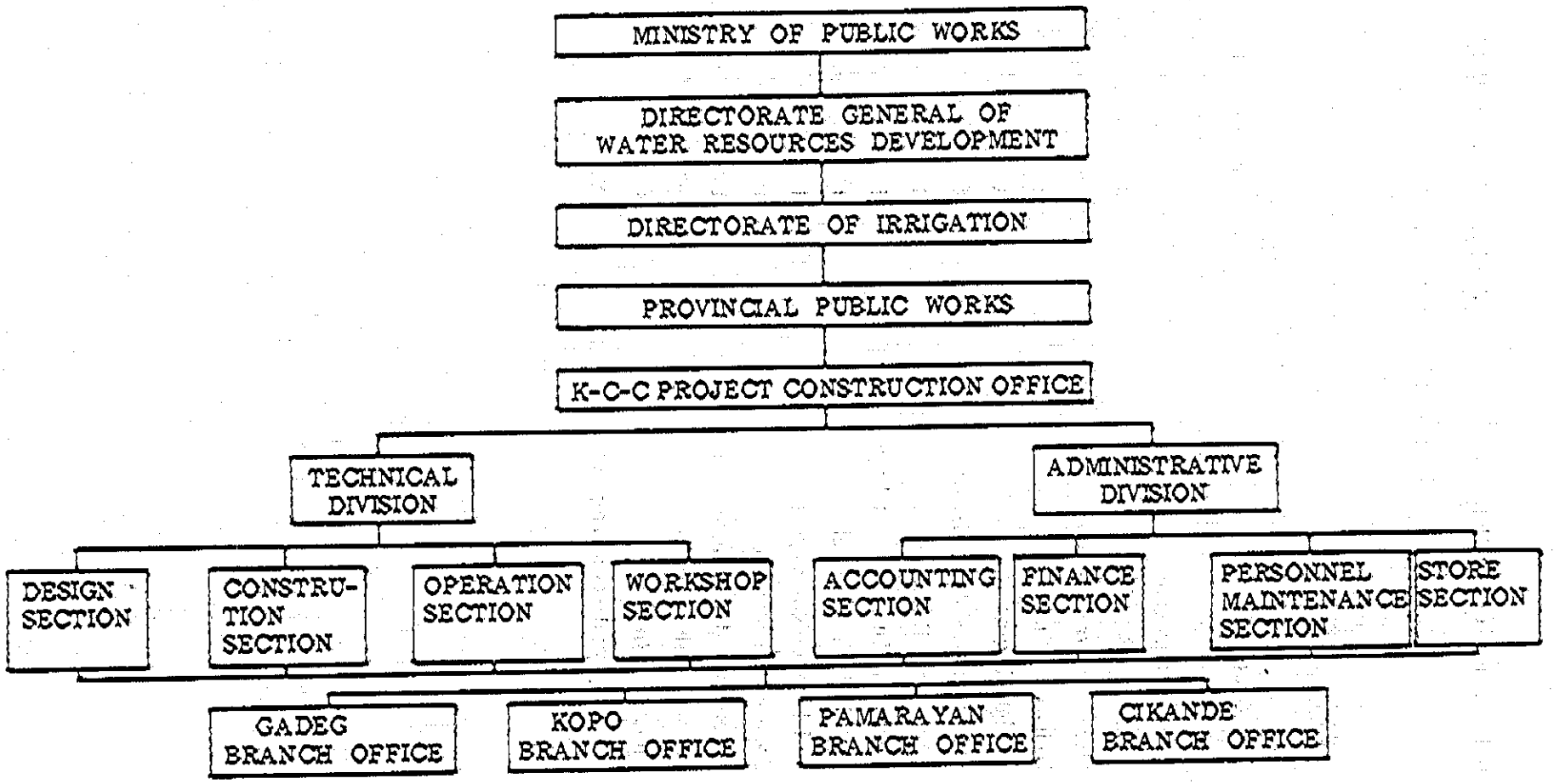


Fig.IX-2

ORGANIZATION OF PROJECT OFFICE

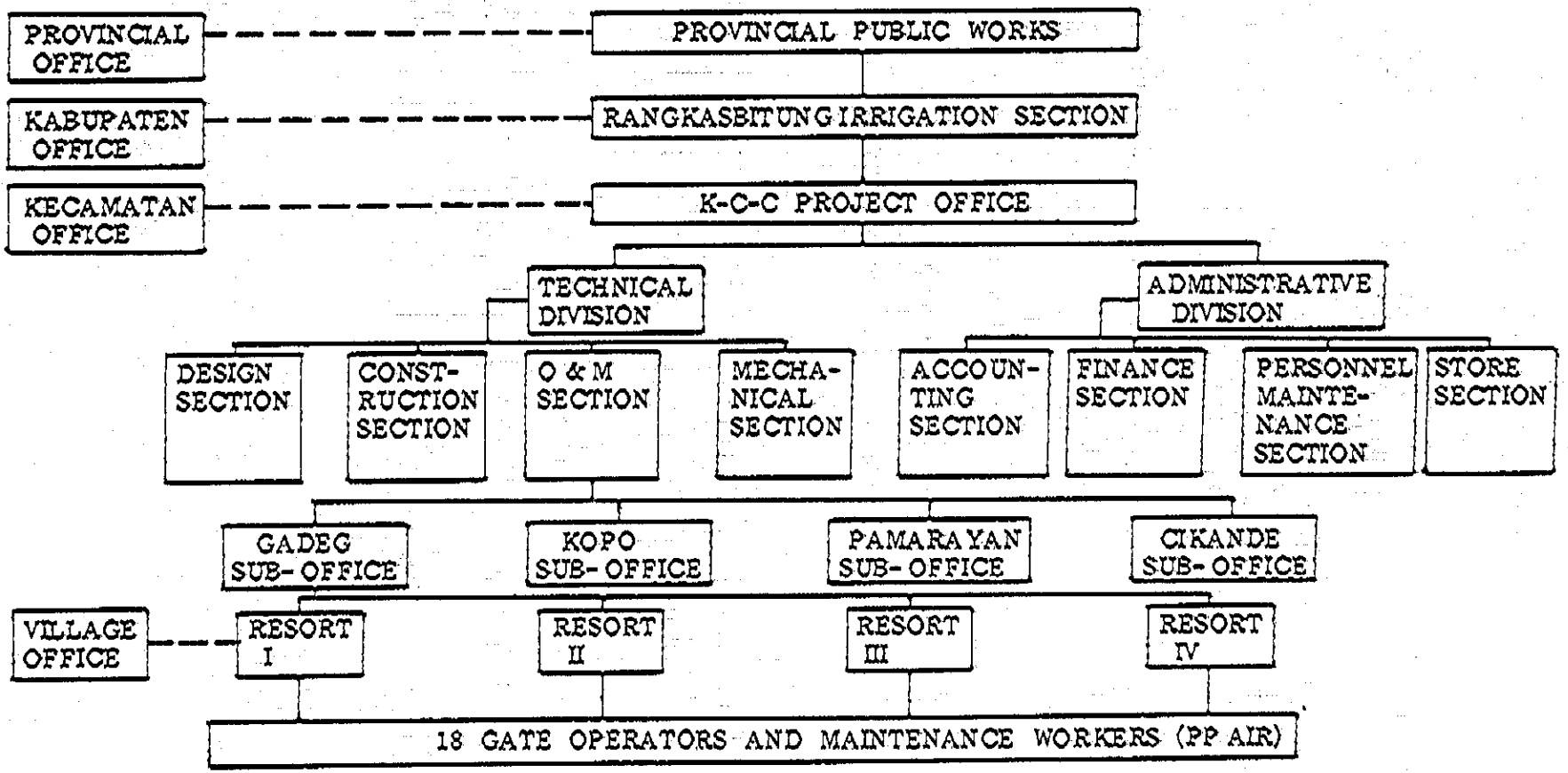
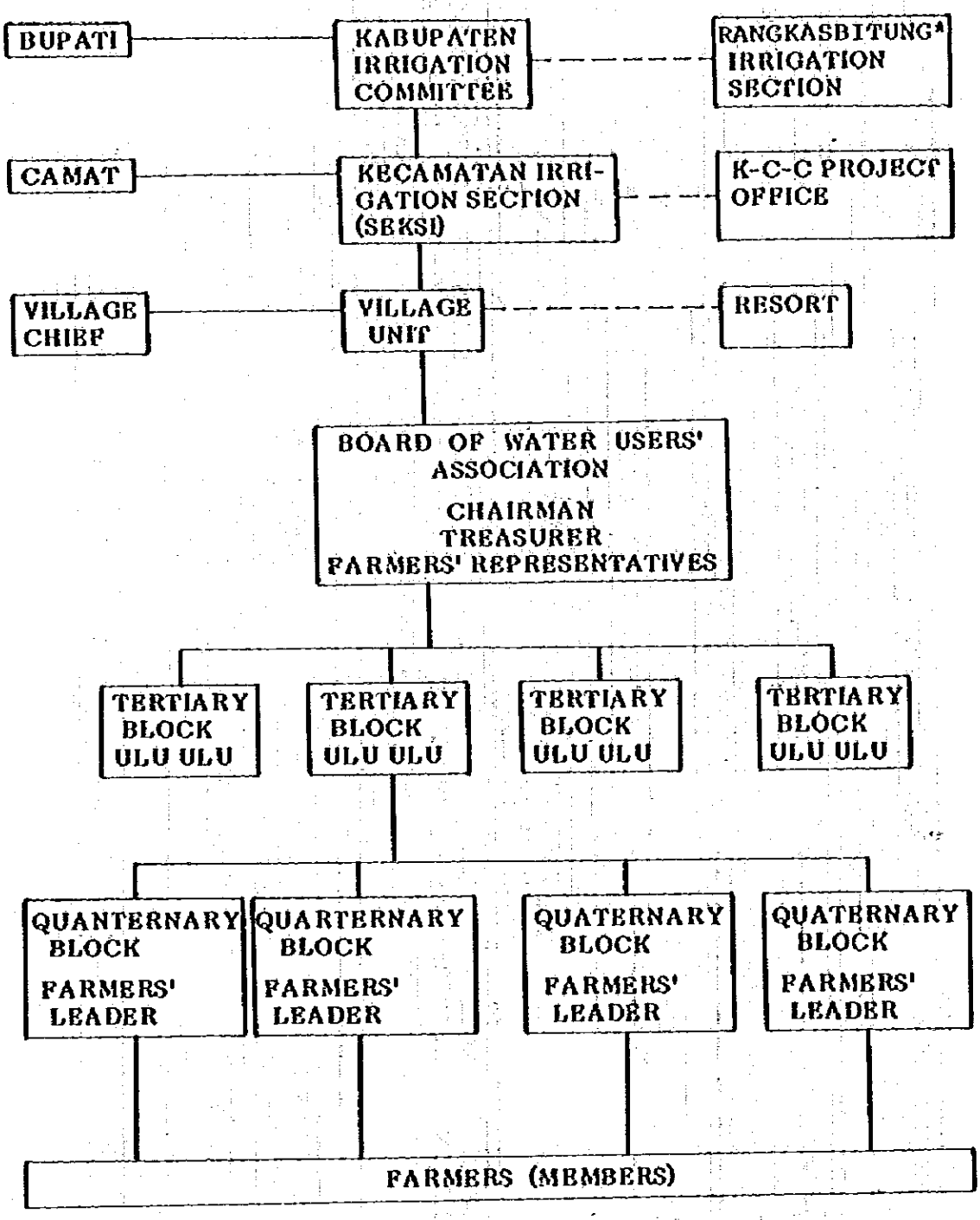


Fig.IX-3 WATER USERS' ASSOCIATION



* : Rangkasbitung office will be moved to Serang after completion of the construction works.

ANNEX - X

COST ESTIMATE

ANNEX - X COST ESTIMATE

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COST ESTIMATE

1. CONDITIONS

1.1 General

The construction cost is estimated based on the following conditions.

(1) The exchange rate used in the estimation is shown as follows:
US $1.00 = Rp 690 (end -1982 level)

(2) Civil works are to be carried out on the international contract basis using contractor's own heavy construction machinery and equipment.

(3) Tertiary development is carried out on the local contract basis.

(4) Taxes on the construction materials, machinery and equipment to be imported from abroad are exempted from the cost estimate.

(5) The construction cost comprises foreign and local currency portions. The cost estimate is made based on the price level in December, 1982. The classification of foreign and local portions is shown below.

Foreign currency portion

(a) Steel gate and other metal works
(b) Depreciation costs for heavy construction machinery and equipment
(c) Contractor's general expenses and profit
(d) Engineering services cost of foreign consultants

Local currency portion

(a) Labour forces
(b) Reinforcement bar and other structural steel
(c) Cement

(d) Sand, gravel and wooden materials
(e) Fuel, oil, etc.
(f) Inland transportation costs
(g) Contractor's general expenses and profit
(h) Engineering services cost of local consultant

(6) The physical contingency of 10% is included in the construction cost in view of the preliminary nature of the estimate.

(7) Price contingencies are also taken into account at an annual escalation rate of 8% per annum for foreign currency portion and 15% per annum for local currency portion.

(8) The associated costs to be financed by the Government, such as the costs for strengthening the extension services, facilities of the water users' association, and improvement of the social infrastructures are not included in the estimate.

1.2 Estimate of Construction Cost

The total construction costs of the Project are estimated as US$35.9 million, which comprise US$22.6 million equivalent of local currency and US$13.3 million of foreign currency. The summary and breakdown of the cost estimate are shown in Table X-1 through Table X-6.

The prices of local materials and labour wages used in the estimate and the unit rates for major works are as shown in Table X-6.

1.3 Annual Disbursement Schedule

The annual disbursement schedule is worked out based on the construction time schedule. The details are stated in Table X-2.

Year	Foreign Currency (10^3US$)	Local Currency (10^3US$)	Total (10^3US$)
1984	502	2,019	2,521
1985	1,057	4,724	5,781
1986	6,013	7,503	13,516
1987	5,708	8,413	14,121
	13,280	22,659	35,939

2. ANNUAL OPERATION AND MAINTENANCE COSTS

The annual operation and maintenance costs amount to US$164,000 which are estimated as 0.5% of the construction cost for the diversion works including dam, intake, spillway and gates and 1.5% for the irrigation systems on the basis of experience gained from projects of similar type and magnitude.

Table X-1 SUMMARY OF CONSTRUCTION COST

Unit: US$10^3

	Item	Total	Foreign Portion	Local Portion
1.	Preparatory Works	1,283	290	993
2.	Diversion Works /1	2,980	1,778	1,202
3.	Canal Works	9,944	4,552	5,392
4.	Tertiary Development	750	220	530
	Sub-total (1-4)	14,957	6,840	8,117
5.	Land Acquisition and House Evacuation/2	2,580	-	2,580
6.	O/M Equipment	600	600	-
7.	Administration Expenses	600	-	600
8.	Engineering Services	1,880	1,264	616
9.	Physical Contingency	2,061	870	1,191
	Sub-total (5-9)	7,721	2,734	4,987
	Total (1-9)	22,678	9,574	13,104
10.	Price Contingency	13,261	3,706	9,555
	Grand Total	35,939	13,280	22,659

/1: including Dam Spillway and Intake Structure

/2: about 65 houses to be evacuated from the submergible area near Gadeg dam site

Table X-2

ANNUAL DISBURSEMENT SCHEDULE OF CONSTRUCTION COST

(US$ 10^3)

	Item	TOTAL FC	TOTAL LC	1984 FC	1984 LC	1985 FC	1985 LC	1986 FC	1986 LC	1987 FC	1987 LC
1.	Preparatory Works	290	993	120	480	170	513	-	-	-	-
2.	Diversion Works	1,778	1,202	-	-	52	31	851	592		579
3.	Canal Works	4,552	5,392					2,276	2,696		2,696
4.	Tertiary Development	220	530	-	-	-	-	110	265	110	265
5.	O/M Equipment	600	-			180	-	420	-	-	-
6.	Administration Expenses	-	600	-	129	-	171	-	171	-	129
7.	Land Acquisition & House Evacuation	-	2,580	-	647	-	1,933	-	-	-	-
8.	Engineering Services	1,264	616	271	132	361	176	361	176	271	132
	Sub-total (1 - 8)	8,704	11,913	391	1,388	763	2,824	4,018	3,900	3,532	3,801
9.	Physical Contingency	870	1,191	39	139	76	282	402	390	353	380
	Sub-total (1 - 9)	9,574	13,104	430	1,527	839	3,106	4,420	4,290	3,885	4,181
10.	Price Contingency	3,706	9,555	72	492	218	1,618	1,593	3,213	1,823	4,232
	Total	13,280	22,659	502	2,019	1,057	4,724	6,013	7,503	5,708	8,413
		(35,939)		(2,521)		(5,781)		(13,516)		(14,121)	

Table X-3

BREAKDOWN OF DIRECT CONSTRUCTION COST

Item	Quant'y	Unit	Unit Cost Foreign	Unit Cost Local	Cost Foreign	Cost Local	Remarks
(1) DAM							(T) Rp. 796,223x10³ (F) Rp. 464,865x10³ (L) Rp. 331,359x10³
1. Excavation C/S	16,200	m³	1,050	450	17,010	7,290	
" W/R	4,050	m³	1,400	550	5,670	2,228	
2. Stripping	9,600	m³	80	20	768	192	
3. Core	12,688	m³	2,400	1,300	30,451	16,494	
4. Filter	7,550	m³	6,650	3,400	50,208	25,670	
5. Transition	18,860	m³	1,300	600	24,518	11,316	
6. Rock zone	39,000	m³	4,250	2,700	165,750	105,300	
7. Riprap	4,800	m³	4,400	2,800	21,120	13,440	
8. Access Road	6,000	m	1,400	13,800	8,400	82,800	
9. Foundation Grouting Curtain	3,000	m	38,700	16,900	116,100	50,700	
Blanket	1,200	m	15,600	9,900	18,720	11,880	
					464,865	331,359	
(2) SPILL WAY							(T) Rp. 1,198,000x10³ (F) Rp. 648,000x10³ (L) Rp. 550,000x10³
1. Common Excavation	51,996	m³	1,050	450	54,595	23,398	
2. Concrete Type (A)	4,554	m³	5,600	37,100	25,502	168,953	
3. Steel Form	3,781	m³	1,100	1,400	4,159	5,293	
4. Rainforcement Bar	260	t	-	447,500	-	116,350	
5. Stone Masonry	1,455	m³	-	33,400	-	48,597	

(Table X-3 cont'd)

Item	Quant'y	Unit	Unit Cost Foreign	Unit Cost Local	Cost Foreign	Cost Local	Remarks
6. Riprap Protection	991	m^3	1,250	8,350	1,238	8,274	
7. Wooden Scaffolding	2,651	m^3	-	780	-	2,067	
8. Metal Works	L.S.		-	-	550,000	110,000	
9. Embankment (Temporary Work)	5,425	m^3	2,380	2,340	12,911	12,694	
					648.000	550.000	

(3) INTAKE

(T) Rp. 62,174,000
(F) Rp. 42,858,000
(L) Rp. 19,316,000

1. Excavation	620	m^3	330	220	204,600	136,400	
2. Embankment	386	m^3	300	370	115,800	142,820	
3. Concrete σ_{28}=210 kg/cm^2	153.3	m^3	5,600	29,000	20,160	104,400	
σ_{28}=160 kg/cm^2	3.6	m^3	5,600	29,000	20,160	104,400	
4. Wooden Form	162.2	m^2		5,400		875,880	
5. Reinforcement Bar	8.1	ton		447,500		3,674,750	
6. Stone Masonry	40.4	m^3		780		31,512	
7. Rip-rap	42.0	m^3	4,400	2,800	184,800	117,600	
8. Steel Sheet Pile	6.3	ton	250,000	10,000	1,575,000	63,000	
9. Screen	300	kg		450		135,000	
10. Gate 3.50x3.00x2	2	Nos	20,000,000	4,500,000	40,000,000	9,000,000	
11. Stop log	0.7	m^3		93,200		65,240	
Total					42,858,040	19,316,232	
					42.858.000	19.316.000	

(Table X-3 cont'd)

Item	Quant'y	Unit	Unit Cost Foreign	Unit Cost Local	Cost Foreign	Cost Local	Remarks
(4) HEAD RACE (BP-4,500)							(T) Rp. 802,125,000 (F) Rp. 430,873,000 (L) Rp. 371,252,000
1. Common Excavation	131,215	m^3	330	220	43,300,950	28,867,300	
2. Excavation of Weathered Rock	25,351	m^3	1,540	860	39,040,540	21,801,860	
3. Embankment Type A	65,600	m^3	300	370	19,680,000	24,272,000	
" Type B	109,720	m^3	2,380	2,340	261,133,600	256,744,800	
4. Spill Way and Waste Way-1	1	No	8,368,000	7,489,000	8,368,000	7,489,000	(B=1.50m, H=1.50m)x2
5. Cross Drain (Type-I-2)	2	Nos	573,000	8,277,000	1,146,000	16,554,000	B=2.00m, H=2.00m
6. Bridge	2	Nos	3,498,000	6,375,000	6,996,000	12,750,000	L=12.00m, B=4.00m
7. Lining	21,337	m^2	2,400	130	51,208,800	2,773,810	L=1,793m, B=11.90m
Total					430,873,890	371,252,770	
					430,873,000	371,252,000	
(5) HEAD RACE (SP 4800-9600)							(T) Rp. 308,200,000 (F) Rp. 187,711,000 (L) Rp. 120,489,000
1. Common Excavation	188,998	m^3	330	220	62,369,340	41,579,560	
2. Excavation of Weathered Rock	33,544	m^3	1,540	860	51,657,760	28,847,840	
3. Embankment Type A	92,389	m^3	300	370	27,716,700	34,350,430	
4. Spill Way & Waste Way-1	1	No	8,368,000	7,489,000	8,368,000	7,489,000	(B=1.50m H=1.50m)x2
5. Bridge	1	No	3,498,000	6,375,000	3,498,000	6,375,000	L-12.00m B-4.00m
6. Lining	14,209	m^2	2,400	130	34,101,600	1,847,170	
Total					187,711,400	120,489,000	
					187,711,000		

(Table X-3 cont'd)

Item	Quant'y	Unit	Unit Cost Foreign	Unit Cost Local	Cost Foreign	Cost Local	Remarks
(6) MAIN CANAL (9622-22665)							
							(T) Rp. 1,919,918,000
							(F) Rp. 998,069,000
							(L) Rp. 921,849,000
1. Common Excavation	378,372	m^3	330	220	124,862,760	83,241,840	
2. Excavation of Weathered Rock	64,808	m^3	1,540	860	99,804,320	55,734,880	
3. Embankment Type A	131,691	m^3	300	370	39,507,300	48,725,670	
" Type B	131,691	m^3	2,380	2,340	313,424,580	308,156,940	
4. Spill Way & Waste Way-2	1	No	4,231,000	4,630,000	4,231,000	4,630,000	B=1.50m H=1.50m
5. Bridge	1	No	12,964,000	12,955,000	12,964,000	12,955,000	L=12.00m B=8.00m
"	5	Nos	3,498,000	6,375,000	17,490,000	31,875,000	B=12.00m B=4.00m
6. Turnout (Type-I-1)	1	No	3,907,000	3,195,000	3,907,000	3,195,000	B=1.30m H=1.30m
" (Type-I-2)	2	Nos	3,094,000	2,976,000	6,188,000	5,952,000	B=1.10m H=1.10m
" (Type-I-2)	3	Nos	2,684,000	2,834,000	8,052,000	8,502,000	B=1.00m H=1.00m
" (Type-II-1)	1	No	1,020,000	1,590,000	1,020,000	1,590,000	ϕ800
" (Type-II-2)	2	Nos	716,000	1,539,000	1,432,000	3,078,000	ϕ600
" (Type-II-3)	8	Nos	714,000	1,488,000	5,712,000	11,904,000	ϕ500
7. Drop-1	2	Nos	203,000	4,011,000	406,000	8,022,000	B=2.00m
8. Check Gate (Type-I-1)	3	Nos	14,925,000	11,232,000	44,775,000	33,696,000	(B=2.50, H=2.50)x2
" " (Type-I-2)	4	Nos	7,594,000	10,290,000	30,376,000	41,160,000	B=2.50, H=2.50
9. Lining	38,776	m^3	2,400	130	93,062,400	5,040,880	
Total					807,214,360	667,459,210	
					807,214,000	667,459,000	

(Table X-3 cont'd)

Item	Quant'y	Unit	Unit Cost Foreign	Unit Cost Local	Cost Foreign	Cost Local	Remarks
(7) SYPHON NO. 1 (SP4500-4800, C=300 m)							
					(T)	Rp.	99,063,000
					(F)	Rp.	9,319,000
					(L)	Rp.	89,744,000
1. Excavation	6,651	m^3	330	220	2,194,830	1,463,220	
2. Embankment	4,221	m^3	300	370	1,266,300	1,561,770	
3. Concrete 28=210 kg/cm^2	819.5	m^3	5,600	37,100	4,589,200	30,403,450	
28=160 kg/cm^2	75.4	m^3	5,600	29,000	422,240	2,186,600	
4. Wooden Form	3,109.6	m^2		5,400		16,791,840	
5. Reinforcement Bar	57.4	ton		447,500		25,686,500	
6. Wooden Scaffolding	907.2	m^3		780		707,616	
7. Stone Masonry	35.9	m^3		33,400		1,199,060	
8. Gravel	226.6	m^3		7,000		1,586,200	
Sub-total					8,472,570	81,586,256	
Others	10	%			847,257	8,158,625	
Total					9,319,000	89,744,000	
(8) SYPHON NO.2 (SP7640-7770)							
					(T)	Rp.	81,009,000
					(F)	Rp.	39,588,000
					(L)	Rp.	41,421,000
1. Excavation	6,654	m^3	330	220	2,162,820	1,441,880	
2. Embankment	5682	m^3	300	370	1,704,600	2,102,340	

(Table X-3 cont'd)

Item		Quant'y	Unit	Unit Cost Foreign	Unit Cost Local	Cost Foreign	Cost Local	Remarks
3. Concrete	σ_{28}=210 kg/cm^2	350.3	m^3	5,600	37,100	1,961,680	12,996,130	
	σ_{28}=160 kg/cm^2	28.6	m^3	5,600	29,000	160,160	829,400	
4. Wooden Form		1,341.6	m^2		5,400		7,244,640	
5. Reinforcement Bar		24.5	ton		447,500		10,963,750	
6. Wooden Scaffolding		356.4	m^3		780		277,992	
7. Stone Masonry		35.9	m^3		33,400		1,199,060	
8. Gravel		85.8	m^3		7,000		600,600	
9. Under-laying Work		1	No		30,000,000	30,000,000		
Sub-total						35,989,260	37,655,792	
Others		10	%			3,598,926	3,765,579	
Total						39,588,186	41,421,371	
						39,588,000	41,421,000	

(9) SECONDARY CANAL-1 (L=2,460m)

(T) Rp. 168,700,000
(F) Rp. 81,530,000
(L) Rp. 87,170,000

1. Excavation		28,751	m^3	330	220	9,487,830	6,325,220	
2. Embankment	Type A	14,375	m^3	300	370	4,312,500	5,318,750	
"	Type B	18,182	m^3	2,380	2,340	43,273,160	42,545,880	
3. Culvert	(Type-II-2)	1	No	5,000	535,000	5,000	535,000	ϕ600 m/m
4. Spill Way & Waste Way-4		1	No	2,767,000	3,399,000	2,767,000	3,399,000	B=1.00m, H=1.00m
5. Cross Drain	(Type-I-4)	2	Nos	366,000	6,844,000	732,000	13,688,000	B=1.20m, H=1.20m
6. Drop-6		3	Nos	63,000	1,264,000	189,000	3,792,000	B=1.00m
7. Check Gate	(Type-II-5)	2	Nos	2,646,000	1,741,000	5,292,000	3,482,000	B=1.00m, H=0.80m
8. Turnout	(Type-II-3)	5	Nos	714,000	1,488,000	3,570,000	7,440,000	ϕ500 m/m
9. Lining		4,959	m2	2,400	130	11,901,600	644,670	
Total						81,530,000	87,170,000	

(Table X-3 cont'd)

Item	Quant'y	Unit	Unit Cost Foreign	Unit Cost Local	Cost Foreign	Cost Local	Remarks
(10) SECONDARY CANAL-2 (L=5,330m)							(T) Rp. 485,620,000 (F) Rp. 246,753,000 (L) Rp. 238,867,000
1. Excavation	54,313	m3	330	220	17,923,290	11,948,860	
2. Embankment Type A	27,156	m3	300	370	8,146,800	10,047,720	
" Type B	68,065	m3	2,380	2,340	161,994,700	159,272,100	
3. Culvert (Type-I-4)	2	Nos	69,000	1,451,000	138,000	2,902,000	B=1.00m, H=1.00m
4. Spill Way & Waste Way-4	1	No	2,767,000	3,399,000	2,767,000	3,399,000	B=1.00m, H=1.00m
5. Cross Drain (Type-I-3)	1	No	443,000	6,434,000	443,000	6,434,000	B=1.50m, H=1.50m
6. Drop-3	3	Nos	110,000	2,385,000	330,000	7,155,000	B=1.20m
" -6	3	Nos	63,000	1,264,000	189,000	3,792,000	B=1.00m
7. Check Gate (Type-II-3)	2	Nos	4,391,000	6,674,000	8,782,000	13,348,000	B=1.50m, H=1.80m
" " (Type-II-5)	2	Nos	2,646,000	1,741,000	2,646,000	1,741,000	B=1.00m, H=0.80m
8. Turnout (Type-II-3)	11	Nos	714,000	1,488,000	3,570,000	7,440,000	ϕ500 m/m
9. Culvert (Type-II-2)	1	No	5,000	535,000	5,000	535,000	ϕ600 m/m
10. Lining	14,806	m2	2,400	130	35,534,400	1,924,780	
Total					246.753.000	238.867.000	
(11) SECONDARY CANAL-3 (L=1,090m)							(T) Rp. 261,029,000 (F) Rp. 130,332,000 (L) Rp. 130,697,000
1. Excavation	462	m3	330	220	152,460	101,640	
2. Embankment Type A	231	m3	300	370	69,300	85,470	
" Type B	46,528	m3	2,380	2,340	110,736,640	108,875,520	
3. Culvert (Type-II-2)	1	No	5,000	535,000	5,000	535,000	ϕ600 m/m
4. Spill Way & Waste Way-4	1	No	2,767,000	3,399,000	2,767,000	3,399,000	B=1.00m, H=1.00m
5. Cross Drain (Type-I-3)	1	No	443,000	6,434,000	443,000	6,434,000	B=1.50m, H=1.50m

(Table V-5 cont'd)

	Item	Quant'y	Unit	Unit Cost Foreign	Unit Cost Local	Cost Foreign	Cost Local	Remarks
6.	Drop-5	2	Nos	68,000	1,404,000	136,000	2,808,000	B=1.00m
	" -6	1	No	63,000	1,264,000	63,000	1,264,000	B=1.00m
7.	Check Gate (Type-II-5)	1	No	2,646,000	1,741,000	2,646,000	1,741,000	B=1.00m, H=0.80m
8.	Turnout (Type-II-3)	3	Nos	714,000	1,488,000	2,142,000	4,464,000	ϕ500 m/m
9.	Lining	4,807	m^2	2,400	130	11,536,800	624,910	
	Total					130,697,000	130,332,000	

(12) SECONDARY CANAL-4 (L=5,900m)

(T) Rp. 272,486,000
(F) Rp. 129,822,000
(L) Rp. 142,664,000

1.	Excavation	178,948	m^3	330	220	59,052,840	39,368,560	
2.	Embankment Type A	65,943	m^3	300	370	19,782,900	24,398,910	
3.	Culvert (Type-I-3)	2	Nos	98,000	1,984,000	196,000	3,968,000	B=1.50m, H=1.50m
	" (Type-I-4)	2	Nos	69,000	1,451,000	138,000	2,902,000	B=1.00m, H=1.00m
4.	Spill Way & Waste Way-4	2	Nos	2,767,000	3,399,000	5,534,000	6,798,000	B=1.00m, H=1.00m
5.	Cross Drain (Type-I-2)	1	No	573,000	8,277,000	573,000	8,277,000	B=2.00m, H=2.00m
	" " (Type-I-4)	1	No	366,000	6,844,000	360,000	6,844,000	B=1.20m, H=1.20m
6.	Drop-4	5	Nos	90,000	1,764,000	450,000	8,820,000	B=1.00m
	" -5	2	Nos	68,000	1,404,000	136,000	2,808,000	B=1.00m
7.	Check Gate (Type-I-3)	1	No	4,391,000	6,674,000	4,391,000	6,674,000	B=1.50m, H=1.80m
	" " (Type-II-4)	2	Nos	2,679,000	2,593,000	5,358,000	5,186,000	B=1.50m, H=1.50m
	" " (Type-II-5)	1	No	2,646,000	1,741,000	2,646,000	1,741,000	B=1.00m, H=0.80m
8.	Turnout (Type-II-3)	16	Nos	714,000	1,488,000	11,424,000	23,808,000	ϕ500 m/m
9.	Lining	8,242	m^2	2,400	130	19,780,800	1,071,460	
	Total					129,822,000	142,664,000	

(Table X-3 cont'd)

Item	Quant'y	Unit	Unit Cost Foreign	Unit Cost Local	Cost Foreign	Cost Local	Remarks
(13) SECONDARY CANAL-5 (L=3,430m)							(T) Rp. 294,404,000 (F) Rp. 152,153,000 (L) Rp. 142,251,000
1. Excavation	31,736	m^3	330	220	10,472,880	6,981,920	
2. Embankment Type A	15,868	m^3	300	370	4,760,400	5,871,160	
" Type B	43,356	m^3	2,380	2,340	103,187,280	101,453,040	
3. Culvert (Type-II-1)	3	Nos	8,000	677,000	24,000	2,031,000	800 m/m
4. Spill Way & Waste Way-4	1	No	2,767,000	3,399,000	2,767,000	3,399,000	B=1.00m, H=1.00m
5. Drop-5	3	Nos	68,000	1,404,000	204,000	4,212,000	B=1.00m
6. Check Gate (Type-II-4)	2	Nos	2,679,000	2,593,000	5,358,000	5,186,000	B=1.00m, H=1.50m
" " (Type-II-5)	1	No	2,646,000	1,741,000	2,646,000	1,741,000	B=1.00m, H=0.80m
7. Turnout (Type-II-3)	7	Nos	714,000	1,488,000	4,998,000	10,416,000	ϕ500 m/m
8. Lining	7,390	m^2	2,400	130	17,736,000	960,700	
Total					152,153,000	142,251,000	
(14) SECONDARY CANAL-6 (L=4,600m)							(T) Rp. 484,831,000 (F) Rp. 250,481,000 (L) Rp. 234,350,000
1. Excavation	45,656	m^3	330	220	15,066,480	10,044,320	
2. Embankment Type A	22,828	m^3	300	370	6,848,400	8,446,360	
" Type B	74,096	m^3	2,380	2,340	176,348,480	173,384,640	
3. Culvert (Type-I-4)	2	Nos	69,000	1,451,000	138,000	2,902,000	B=1.00m, H=1.00m
" (Type-II-2)	1	No	5,000	535,000	5,000	535,000	ϕ600
4. Spill Way & Waste Way-4	1	No	2,767,000	3,399,000	2,767,000	3,399,000	B=1.00m, H=1.00m
5. Cross Drain (Type-I-4)	1	No	366,000	6,844,000	366,000	6,844,000	B=1.20m, H=1.20m
6. Drop-3	2	Nos	110,000	2,385,000	220,000	4,770,000	B=1.20m

(Table X-3 cont'd)

	Item	Quant'y	Unit	Unit Cost Foreign	Unit Cost Local	Cost Foreign	Cost Local	Remarks
7.	Check Gate (Type-II-4)	4	Nos	2,679,000	2,593,000	10,716,000	10,372,000	B=1.00m, H=1.50m
8.	Turnout (Type-II-3)	8	Nos	714,000	1,488,000	5,712,000	11,904,000	ϕ500 m/m
9.	Lining	13,456	m^2	2,400	130	32,294,400	1,749,280	
	Total					250.481.000	234.350.000	

(15) SECONDARY CANAL-7 (L=3,200m)

(T) Rp. 332,836,000
(F) Rp. 172,173,000
(L) Rp. 160,663,000

1.	Excavation	32,407	m^3	330	220	10.694,310	7.129,540	
2.	Embankment Type A	16,204	m^3	300	370	4,861,200	5,995,480	
	" Type B	51,263	m^3	2,380	2,340	122,005,940	119,955,420	
3.	Culvert (Type-I-4)	1	No	69,000	1,451,000	69,000	1,451,000	B=1.00m, H=1.00m
	" (Type-II-1)	1	No	8,000	677,000	8,000	677,000	ϕ800
	" (Type-II-2)	1	No	5,000	535,000	5,000	535,000	ϕ600
4.	Spill Way & Waste Way-4	1	No	2,767,000	3,399,000	2,767,000	3,399,000	B=1.00m, H=1.00m
5.	Cross Drain (Type-I-2)	1	No	573,000	8,277,000	573,000	8,277,000	B=2.00m, H=2.00m
6.	Drop-6	1	No	63,000	1,264,000	63,000	1,264,000	B=1.00m
7.	Check Gate (Type-II-5)	1	No	2,646,000	1,741,000	2,646,000	1,741,000	B=1.00m, H=0.80m
8.	Turnout (Type-II-3)	6	Nos	714,000	1,488,000	4,284,000	8,928,000	ϕ500 m/m
9.	Lining	10,082	m^2	2,400	130	24,196,800	1,310,660	
	Total					172.173.000	160.663.000	

(Table X-3 cont'd)

Item	Quant'y	Unit	Unit Cost Foreign	Unit Cost Local	Cost Foreign	Cost Local	Remarks
(16) SECONDARY CANAL-8 (L=3,560m)						(T) Rp. 620,390,000 (F) Rp. 321,907,000 (L) Rp. 298,483,000	
1. Excavation	38,097	m3	330	220	12,572,010	8,381,340	
2. Embankment Type A	19,049	m3	300	370	5,714,000	7,048,130	
" Type B	105,953	m3	2,380	2,340	252,168,140	247,930,020	
3. Culvert (Type-II-1)	1	No	8,000	677,000	8,000	677,000	ϕ800
" (Type-II-2)	1	No	5,000	535,000	5,000	535,000	ϕ600
4. Spill Way & Waste Way-4	1	No	2,767,000	3,399,000	2,767,000	3,399,000	B=1.00m, H=1.00m
5. Cross Drain (Type-I-1)	1	No	720,000	10,206,000	720,000	10,206,000	B=2.50m, H=2.50m
6. Drop-4	2	Nos	90,000	1,764,000	180,000	3,528,000	B=1.00m
7. Check Gate (Type-II-4)	1	No	2,679,000	2,593,000	2,679,000	2,593,000	B=1.00m, H=1.50m
" " (Type-II-5)	1	No	2,646,000	1,741,000	2,646,000	1,741,000	B=1.00m, H=0.80m
8. Turnout (Type-II-3)	7	Nos	714,000	1,488,000	4,998,000	10,416,000	ϕ500 m/m
9. Lining	15,604	m2	2,400	130	37,449,600	2,028,520	
Total					321,907,000	298,483,000	
(17) SECONDARY CANAL-9 (L=2,860m)						(T) Rp. 893,537,000 (F) Rp. 263,064,000 (L) Rp. 630,473,000	
1. Excavation	21,627	m3	330	220	7,136,910	4,7759,940	
2. Embankment Type A	10,814	m3	300	370	3,244,200	4,001,180	
" Type B	50,609	m3	2,380	2,340	120,449,420	118,425,000	
3. Culvert (Type-I-4)	1	No	69,000	1,451,000	69,000	1,451,000	B=1.00m, H=1.00m
4. Spill Way & Waste Way-4	1	No	2,767,000	3,399,000	2,767,000	3,399,000	B=1.00m, H=1.00m
5. Cross Drain (Type-I-1)	1	No	720,000	10,206,000	720,000	10,206,000	B=2.50m, H=2.50m

(Table X-3 cont'd)

Item	Quant'y	Unit	Unit Cost Foreign	Unit Cost Local	Cost Foreign	Cost Local	Remarks
6. Drop-4	5	Nos	90,000	1,764,000	180,000	3,528,000	B=1.00m
7. Check Gate (Type-II-4)	2	Nos	2,679,000	2,593,000	5,358,000	5,186,000	B=1.00m, H=1.50m
8. Turnout (Type-II-3)	7	Nos	714,000	1,488,000	4,998,000	10,416,000	ø500 m/m
9. Lining	11,603	m^3	2,400	130	27,847,200	1,508,390	
Total					263,064,000	630,473,000	

(18) INSPECTION ROAD

(T) Rp. 283,161,000
(F) Rp. 7,653,000
(L) Rp. 275,508,000

1. Gravel Pavement							
Head Race & Main Canal	51,800	m^2	60	2,160	3,108,000	111,888,000	L=14,800m, B=350m
Secondary Canal	75,750	m^2	60	2,160	4,545,000	163,620,000	L=25,250m, B=300m
Total					7,653,000	275,508,000	

(19) TERTIARY DEVELOPMENT

(T) Rp. 517,698,000
(F) Rp. 151,616,000
(L) Rp. 366,082,000

Tertiary Development	3,500	ha	43,319	104,595	151,616,500	366,082,500	
					151,616,000	366,082,000	

Table X-4 Unit Construction Cost
(Diversion Dam)

Work	Item	Unit	Unit Cost (Rp) Foreign	Local	Total
Excavation					
	stripping	(m^2)	80	20	100
	common (C/S)	(m^3)	1,050	450	1,500
	weathered rock	(m^3)	1,400	550	1,950
	tunnel	(m^3)	15,400	13,000	18,400
Embankment					
	earth	(m^3)	1,300	600	1,900
	earth-core	(m^3)	2,400	1,300	3,700
	filter	(m^3)	6,650	3,400	10,050
	rock	(m^3)	4,250	2,700	6,950
	riprap	(m^3)	4,400	2,800	7,200
Concrete					
	open	(m^3)	15,500	28,000	43,500
	form (open)	(m^2)	1,300	1,100	2,400
	reinforcement bar	(t)	0	418,700	418,700
	tunnel	(m^3)	15,700	30,000	45,700
	form (tunnel)	(m^2)	10,100	400	10,500
	steel support	(t)	0	527,000	527,000
	cap concrete	(m^3)	6,100	9,000	15,100
Grout					
	backfill	(m^3)	14,900	18,000	32,900
	consolidation	(m)	14,800	9,100	23,900
	curtain	(m)	38,700	16,900	55,600
	blanket	(m)	15,600	9,900	25,600

Table X-5 Unit Construction Cost (Canal System)

(Unit: Rp)

	Description	Unit	Foreign	Local	Total
1.	Main and Secondary Canal				
	Clearing & Grubbing	(m^2)	20	10	30
	Stripping	(m^3)	335	135	470
	Common Excavation	(m^3)	330	220	550
	Excavation of Weathered Rock	(m^3)	1,540	860	2,400
	Embankment Type A /1	(m^3)	300	370	670
	Embankment Type B /2	(m^3)	2,380	2,340	4,720
	Back filling	(m^3)	1,160	920	2,080
	Gravel Pavement	(m^2)	60	2,160	2,220
	Sod-facing	(m^2)	-	330	330
	Concrete Type A /3	(m^3)	5,600	37,100	42,700
	Concrete Type B /4	(m^3)	5,600	35,400	41,000
	Concrete Type C /5	(m^3)	5,600	29,000	34,600
	Wooden Form	(m^2)	-	5,400	5,400
	Wooden Scaffolding	(m^3)	-	780	780
	Steel Form	(m^2)	1,100	1,400	2,500
	Reinforcement Bar	ton	-	447,500	447,500
	Stone Masonry	(m^3)	-	33,400	33,400
	Riprap Protection	(m^3)	1,250	8,350	9,600
	Stoplog	(m^3)	-	93,200	93,200
	Precast Concrete Pipe				
	Dia. 1,000mm	lin.m	-	29,700	29,700
	800mm	"	-	23,700	23,700
	600mm	"	-	12,300	12,300
	500mm	"	-	10,700	10,700
	400mm	"	-	9,100	9,100
	300mm	"	-	7,500	7,500
2.	Tertiary Canal				
	Excavation	(m^3)	-	700	700
	Embankment	(m^3)	-	900	900

Note: /1 By excavated materials
/2 By borrowed materials within 5km
/3 Reinforced concrete
/4 Plain concrete
/5 Lean concrete

Table X-6 Major Material Price and Labour Wages

Item		Unit	Unit Price (Rp.)
1. Materials			
(1)	Portland cement	ton	62,500
(2)	Reinforcement bar	ton	370,000
(3)	Timber	(m^3)	70,000
(4)	Crushed stone	(m^3)	7,000
(5)	Fine sand	(m^3)	5,500
(6)	Coarse sand	(m^3)	5,000
(7)	Gravel	(m^3)	7,000
(8)	Wire and nail	kg	600
(9)	Gasoline	lit.	240
(10)	Light oil	lit.	85
(11)	Lubricant	lit.	1,000
(12)	Grease	kg	850
2. Labour			
(1)	Common labour	man-day	1,500
(2)	Skilled labour	man-day	2,500
(3)	Foreman	man-day	3,000
(4)	Carpenter	man-day	3,000
(5)	Mason	man-day	2,500
(6)	Concrete worker	man-day	2,500
(7)	Driver	man-day	2,000
(8)	Operator	man-day	3,000
(9)	Asst. operator	man-day	2,000

ANNEX - XI

PROJECT EVALUATION

ANNEX-XI PROJECT EVALUATIONS

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ANNEX - XI

PROJECT EVALUATIONS

1. GENERAL

The Project evaluation is carried out in order to ascertain the feasibility of the Project in view of economic, financial and socio-economic aspects.

The economic feasibility for the Project is firstly evaluated by calculating the economic internal rate of return (hereinafter referred to as the "EIRR"). Further, sensitivity analysis of EIRR is also made with respect to changes in the economic project cost, market price of rice and unit yield of rice. In the calculation, the economic costs and benefits are estimated based on the study results in ANNEX-V and X.

Secondly, the financial aspect is evaluated by calculating the capacity to pay. The calculation of capacity to pay is to confirm the soundness of the Project from the farmers' viewpoint.

Finally, intangible socio-economic impacts of the Project are briefly studied in due consideration of the effect of the Project on the regional development.

2. ECONOMIC EVALUATION

2.1 Basic Assumptions

The economic evaluation of the Project is made on the basis of the following assumptions:

i) The Project implementation period is about 4 years from 1984 to 1987 as mentioned in ANNEX-VIII.

ii) Only direct benefit is counted in the evaluation and any indirect or intangible benefits are not taken into account.

iii) The current prices as of the end of 1982 are used in the evaluation.

iv) The exchange rate of Indonesian Rupiah to US Dollar is taken to be Rp. 690 equivalent to US$1.

v) The economic useful life of the Project is taken as 50 years from 1984 to 2033.

2.2 Economic Price

As stated in ANNEX-VI, economic farm gate prices of crop production and farm inputs are estimated based on the projected international market price forecasted by IBRD in the long term range for 1990 based on 1981 constant US Dollars.

The economic prices of the construction materials and equipment to be imported from abroad are estimated based on the CIF values in Jakarta which are preliminarily converted from the present FOB prices in Japan, and cost and price related to the inland transportation between Jakarta and Serang.

As for the local material, labour wages, etc. related to the construction and farming practices, the present market price is directly taken into account.

2.3 Project Cost

2.3.1 Economic Cost

The Project cost broadly comprises the costs for:

i) preparatory works,
ii) construction of project facilities,
iii) land acquisition,
iv) procurement of O & M equipment (first procurement only)
v) administration expenses,
vi) engineering services,
vii) physical contingency, and
viii) price contingency.

Among the costs mentioned above, all the costs except the costs for land acquisition and price contingency are counted as the economic cost. In addition, the

construction cost for the on-farm development works by farmers of US$500,000 has been included.

For the calculation of the economic costs, the conversion rate of 0.957 has been applied to the financial prices based on the following assumptions:

- The costs of materials, mechanical works and contractor's profits are 80% and labor costs 20% of the total financial price,
- The economic price of materials, mechanical works and contractor's profits are the same as the financial price,
- Labor inputs consist of 70% of unskilled labor and 30% of skilled labor,
- The financial and economic prices of one man-day of skilled labor are Rp.3,000, and
- The financial and economic prices of one man-day of unskilled labor are Rp.1,500 and Rp.900 respectively.

With the above assumptions, the economic price of civil works has been calculated as follows:

$$80\% + 20\% \times \frac{(30 \times 3{,}000) + (70 \times 900)}{(30 \times 3{,}000) + (70 \times 1{,}500)} = 95.7\%$$

The total economic cost and its annual disbursement thus estimated are as shown in Table XI-1 and XI-2.

2.3.2 Annual Operation and Maintenance Costs

The annual operation and maintenance costs of US$164,000 are estimated as 0.5% of the construction cost for diversion dam and 1.5% for the irrigation systems on the basis of experience gained from projects of similar type and magnitude.

2.3.3 Replacement Costs

The replacement costs of US$870,000 are required at the interval of 25 years after the completion of the construction of gates of spillway and intake structure.

2.4 Project Benefit

The direct project benefit is evaluated as the net incremental income from the future-without-project condition to the future-with-project condition.

The benefit will come out immediately after the implementation of the Project. The benefit is expected to increase and attain its maximum level at full development stage (Table XI-3).

The anticipated annual incremental benefits of the Project are estimated in terms of economic value as shown in Table XI-4.

2.5 Economic Internal Rate of Return (EIRR)

Using the costs and benefit estimated in the above, the cost and benefit streams are firstly prepared as shown in Table XI-5, then the EIRR is calculated by electronic computer. The calculated EIRR is 17.4% and indicates the economic soundness of the Project.

2.6 Sensitivity Analysis

In order to evaluate further the soundness of the Project to the possible changes of economic conditions in future, the sensitivity analysis is made for the following critical conditions in terms of internal rate of return.

i) Cost increase due to unforeseen geological and topographical conditions and increase of material costs.
ii) Decrease of forecasted market price of rice.
iii) Delay in construction period.

The results of the tests are given below:

	Assumptions	EIRR (%)
(i)	Reduction in price of rice from $403 per ton to $380 per ton, CIF Jakarta	15.6
(ii)	Reduction in yield of rice by 10 per cent (4.5 ton/ha at full development)	15.4
(iii)	Two years delay in construction period	14.9
(iv)	Cost increase of 20 per cent	14.9

3. FINANCIAL EVALUATION

3.1 General

The financial feasibility of the Project is evaluated from the viewpoint of farmer's economy. In this connection, the assessment on the amount of water charge to be collected from the water users is made on preliminary basis.

3.2 Financial Cost

Based on the current market prices and costs as of the end of 1982, the financial cost of the Project is estimated to be US$35.9 million equivalent comprising US$22.6 million for the local currency and US$13.3 million for the foreign currency as shown in Table XI-6. In this estimate, the physical contingency of 10%, and the price contingency of 8% per annum for foreign currency portion and 15% for local currency portion is considered to the direct cost. Table Table X-7 shows the annual disbursement schedule of the said financial cost.

3.3 Capacity to Pay

For evaluating the Project feasibility from the financial aspect of farmers, typical farm budget analyses are made under both the future with project and the future without project conditions as shown in Table X-8.

The capacity to pay expected under the future with project condition would be Rp.176,900 per annum in 0.4ha farm in the Project area.

3.4 Water Charge

When the Project facilities are completed and water is released to the farmers, but if the water charge is not collected, all the costs of the Project will have to be borne by the Government, and such expenditure will become a heavy burden to the Government. It is generally understood that the water charge is imposed to the water users, and the water charges thus collected is spent for the payment of O & M expenditures incurred to the Project and for the repayment of the capital cost of the Project. In Indonesia, however, the farmers traditionally do not pay any water charge directly, but contribute indirectly by paying the IPEDA tax.

The recent Government's decree and agreements made with the international lending institutions provide the conditions that the Government shall collect the water charges from the water users and recover the entire O & M cost, and that the rate of water charge shall be reviewed and possibly increased to recover a portion of the capital cost of the Project.

The annual O & M cost required for the Project is estimated at US$164,000 which is equivalent to about US$47/ha. This corresponds to about 7% of the capacity to pay in 0.4ha area.

The water charge to be collected from the water users would have to be within a reasonable range in the capacity to pay that could still give sufficient incentive to the farmers. With this view, the prospective water charge is recommended to be Rp.32,000/ha/annum, i.e. the required O & M cost. This prospective water charge would be the Project revenue in the financial evaluation on the Project.

4. SOCIO-ECONOMIC IMPACT

In additon to the direct benefits stipulated in the economic evaluation, favourable but intangible socio-economic impacts are expected from the implementation of the Project.

4.1 Foreign Exchange Saving

Under the Project implementation, paddy production will increase to about 35,000 tons per annum from the present production of 12,160 tons. Out of this increased production, it is expected that the marketable rice would be about 17,000 tons after deducting the local consumption. This surplus would reduce the annual amount of imported rice, resulting in the saving of foreign exchange amounting to around US$6.9 million equivalent.

4.2 Increase of Employment Opportunity to Local People

Employment opportunity to the local people will be increased by the Project implementation, and a favourable impact will be given to the national economy. Furthermore, the employee will be able to gain more experience, technical

know-how, skillfulness in the various working fields. These accumulations would be applied to the future development in West Java.

4.3 Improvement of Local Transportation

The local transportation will be improved much by the construction of the operation and maintenance roads along the irrigation canals. The expanded road system will not only enhance the economic activity in and around the Project area but also contribute to inter-regional accessibility and communications.

Table XI-1 SUMMARY OF ECONOMIC COST

Unit: US$ 10^3

Item	Economic Cost
1. Preparatory Works /1	1,228
2. Diversion Works	2,852
3. Canal Works	9,516
4. Tirtiary Development & On-farm Development	1,196
Sub-total (1-4)	(14,792)
5. O & M Equipment	600
6. Administration Expenses	600
7. House Evacuation /2	325
8. Engineering Services	1,880
Sub-total (5-8)	(3,405)
9. Physical Contingency	1,820
Total	20,017

/1 : including cost for office and quarters

/2 : About 65 houses in the submergible area near Gadeg dam site to be evacuated

Table XI-2

ANNUAL DISBURSEMENT SCHEDULE OF ECONOMIC COST

US$10^3

	Item	Total	1984	1985	1986	1987
1.	Preparatory Works /1	1,228	574	654		
2.	Diversion Works	2,852	-	79	1,381	1,392
3.	Canal Works	9,516	-	-	4,758	4,758
4.	Tirtiary Development & On-farm Development	1,196	-	-	598	598
	Sub-total	(14,792)	(574)	(733)	(6,737)	(6,748)
5.	O/M Equipment	600	-	180	420	-
6.	Administration Expenses	600	129	171	171	129
7.	House Evacuation	325	325	-	-	-
8.	Engineering Services	1,880	403	537	537	403
9.	Physical Contingency	1,820	143	162	787	728
	TOTAL	20,017	1,574	1,783	8,652	8,008

/1: including cost for office and quarters

Table XI-3 ANNUAL PRODUCTION VALUE UNDER FUTURE WITH PROJECT

Crop and item	Year after commencement of irrigation				
	1	2	3	4	5
Rice					
Yield (ton/ha)	4.0	4.4	4.6	4.8	5.0
Gross Production Value (10^3Rp/ha)	720	792	828	864	900
Production Cost (10^3Rp/ha)	333	347	361	376	392
Net Production Value (10^3Rp/ha)	387	445	467	488	508
Planted/Harvested Area (ha)	7,000	7,000	7,000	7,000	7,000
Total N.P.V. (10^6Rp)	2,709	3,115	3,269	3,416	3,556
Palawija (Groundnut)					
Yield (ton/ha)	1.0	1.1	1.2	1.2	1.2
Gross Production Value (10^3Rp/ha)	420	462	504	504	504
Production Cost (10^3Rp/ha)	227	249	274	274	274
Net Production Value (10^3Rp/ha)	193	213	230	230	230
Planted/Harvested Area (ha)	3,500	3,500	3,500	3,500	3,500
Total N.P.V. (10^6Rp)	676	746	805	805	805
Total N.P.V. of Rice and Palawija	3,385	3,861	4,074	4,221	4,361

N.P.V.: Net Production Value

Table XI-4

INCREMENTAL PROJECT BENEFIT BY YEAR OF DEVELOPMENT

Unit: 10^6Rp/10^6US$

Year	Future With Project			Future Without Project			Incremental Benefit (1) - (2)	
	Rice (3,500hax2)	Palawija (3,500ha)	Total (1)	Rice (3,800ha)	Palawija (380ha)	Total (2)	Rp	US$
1988	2,709	676	3,385	1.167	49	1,216	2,169	3,143
1989	3,115	746	3,861	"	"	"	2,645	3,833
1990	3,269	805	4,074	"	"	"	2,858	4,142
1991	3,416	805	4,221	"	"	"	3,005	4,355
1992	3,556	805	4,361	"	"	"	3,145	4,558

Table XI-5 COST BENEFIT STREAM (ECONOMIC PRICE)

(US$ 1,000)

Year in Order	Direct Cost	O & M Cost	Benefit
1	1574.00	0.00	0.00
2	1783.00	0.00	0.00
3	8652.00	0.00	0.00
4	8008.00	0.00	0.00
5	0.00	164.00	3143.00
6	0.00	164.00	3833.00
7	0.00	164.00	4142.00
8	0.00	164.00	4355.00
9	0.00	164.00	4558.00
10	0.00	164.00	4558.00
11	0.00	164.00	4558.00
12	0.00	164.00	4558.00
13	0.00	164.00	4558.00
14	0.00	164.00	4558.00
15	0.00	164.00	4558.00
16	0.00	164.00	4558.00
17	0.00	164.00	4558.00
18	0.00	164.00	4558.00
19	0.00	164.00	4558.00
20	0.00	164.00	4558.00
21	0.00	164.00	4558.00
22	0.00	164.00	4558.00
23	0.00	164.00	4558.00
24	0.00	164.00	4558.00
25	0.00	164.00	4558.00
26	0.00	164.00	4558.00
27	0.00	164.00	4558.00
28	0.00	164.00	4558.00
29	0.00	1034.00	4558.00
30	0.00	164.00	4558.00
31	0.00	164.00	4558.00
32	0.00	164.00	4558.00
33	0.00	164.00	4558.00
34	0.00	164.00	4558.00
35	0.00	164.00	4558.00
36	0.00	164.00	4558.00
37	0.00	164.00	4558.00
38	0.00	164.00	4558.00
39	0.00	164.00	4558.00
40	0.00	164.00	4558.00
41	0.00	164.00	4558.00
42	0.00	164.00	4558.00
43	0.00	164.00	4558.00
44	0.00	164.00	4558.00
45	0.00	164.00	4558.00
46	0.00	164.00	4558.00
47	0.00	164.00	4558.00
48	0.00	164.00	4558.00
49	0.00	164.00	4558.00
50	0.00	164.00	4558.00
TOTAL	20017.00	8414.00	206909.00

Table XI-6

SUMMARY OF PROJECT COST
(FINANCIAL PRICE)

Unit: US$103

	Item	Total	Foreign Portion	Local Portion
1.	Preparatory Works	1,283	290	993
2.	Diversion Works /1	2,980	1,778	1,202
3.	Canal Works	9,944	4,552	5,392
4.	Tertiary Development	750	220	530
	Sub-total (1-4)	14,957	6,840	8,117
5.	Land Acquisition and House Evacuation/2	2,580	-	2,580
6.	O/M Equipment	600	600	-
7.	Administration Expenses	600	-	600
8.	Engineering Services	1,880	1,264	616
9.	Physical Contingency	2,061	870	1,191
	Sub-total (5-9)	7,721	2,734	4,987
	Total	25,002	11,124	13,878
10.	Price Contingency	13,261	3,706	9,555
	Grand Total	35,939	13,280	22,659

/1: including Dam Spillway and Intake Structure

/2: about 65 houses to be evacuated from the submergible area near Gadeg dam site

Table XI-7

ANNUAL DISBURSEMENT SCHEDULE OF PROJECT COST (Financial)

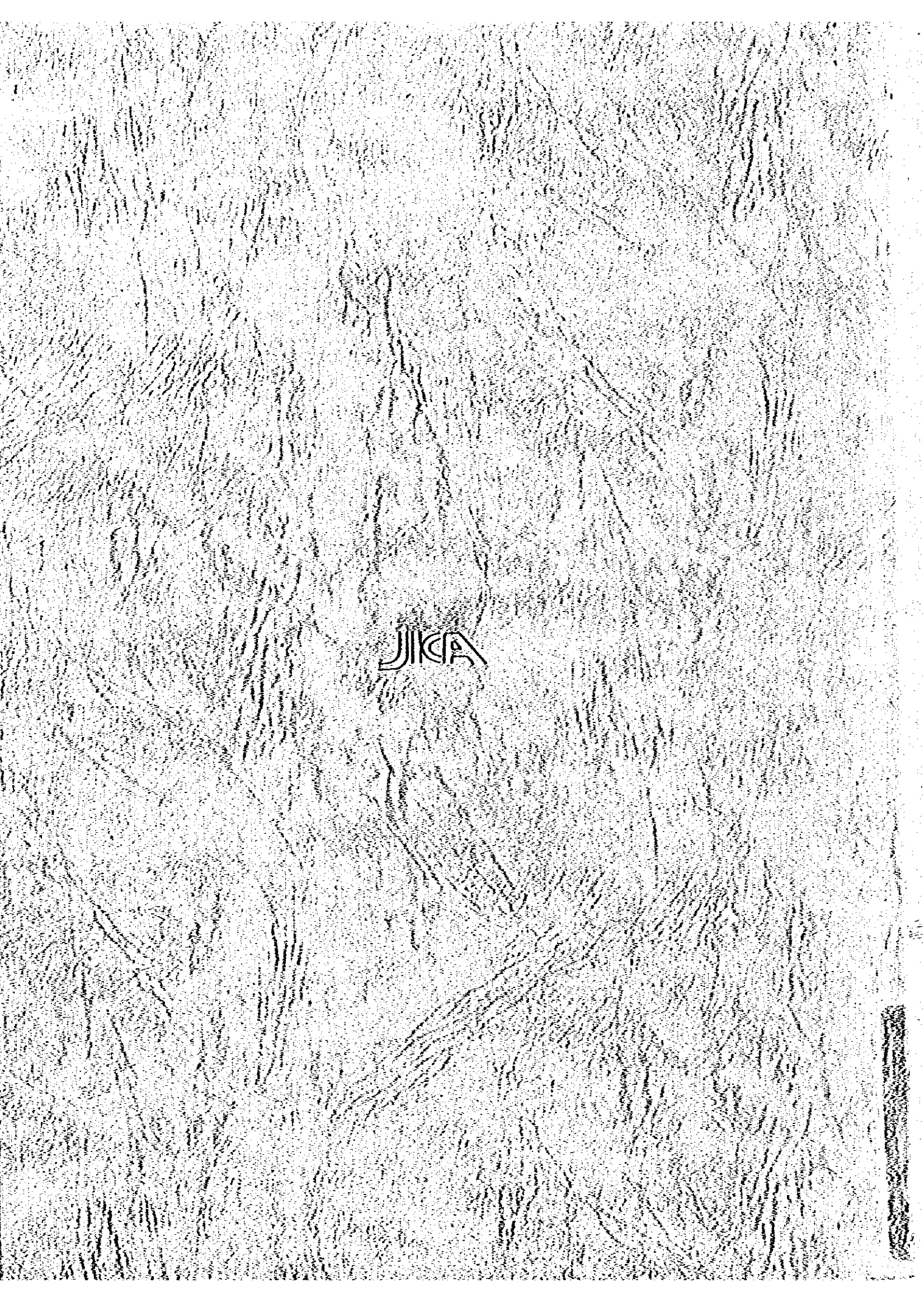
(US$ 10^3)

Item	TOTAL FC	TOTAL LC	1984 FC	1984 LC	1985 FC	1985 LC	1986 FC	1986 LC	1987 FC	1987 LC
1. Preparatory Works	290	993	120	480	170	513	-	-	-	-
2. Diversion Works	1,778	1,202	-	-	52	31	851	592		579
3. Canal Works	4,552	5,392					2,276	2,696		2,696
4. Tertiary Development	220	530	-	-	-	-	110	265	110	265
5. O/M Equipment	600	-			180	-	420	-	-	-
6. Administration Expenses	-	600	-	129	-	171	-	171	-	129
7. Land Acquisition & House Evacuation	-	2,580	-	647	-	1,933	-	-	-	-
8. Engineering Services	1,264	616	271	132	361	176	361	176	271	132
Sub-total (1 - 8)	8,704	11,913	391	1,388	763	2,824	4,018	3,900	3,532	3,801
9. Physical Contingency	870	1,191	39	139	76	282	402	390	353	380
Sub-total (1 - 9)	9,574	13,104	430	1,527	839	3,106	4,420	4,290	3,885	4,181
10. Price Contingency	3,706	9,555	72	492	218	1,618	1,593	3,213	1,823	4,232
Total	13,280	22,659	502	2,019	1,057	4,724	6,013	7,503	5,708	8,413
	(35,939)		(2,521)		(5,781)		(13,516)		(14,121)	

Table XI-8

TYPICAL FARM BUDGET
(0.4ha Farm)

		Without Project (Rp)	With Project (Rp)
1.	Gross Income	223,400	756,000
	Farm income	186,200	756,000
	Rainy season paddy	(172,800)	(270,000)
	Dry season paddy	(0)	(270,000)
	Palawija crops (Groundnut)	(13,400)	(216,000)
	Other income	37,200	0
2.	Expenditures	199,200	579,100
	Farming expenditures	38,000	143,400
	Rainy season paddy	(36,400)	(44,500)
	Dry season paddy	(0)	(44,500)
	Palawija crops (Groundnut)	(1,600)	(54,400)
	Taxes and interest	11,200	35,700
	Living expenses	150,000	400,000
3.	Net Income (Capacity to pay)	24,200	176,900
		(US$35)	(US$256)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