

- c) Construction of the project facilities will create employment opportunities in the central and south region of the country. The employment opportunity is preliminary estimated at around 0.8-1.0 million man-days for construction works.
- d) Agricultural development in the Choluteca plain will create year round employment opportunities. As noted in Chapter 4.5, the annual man-power requirement for cultivation in the Western plain, for instance, is estimated to be around 2.7 million man-days (9,900 man-years) per annum. The economic and social impacts of such an increase in employment will be of great significance.
- e) Resettlement of farmers will be promoted. As noted in Chapter 4.7, about 1,750 families may possibly be settled in the existing and expropriable area in the Western plain, in addition to the existing 270 families. The resettlement is actively promoted by the government, and its social impacts will be of great importance.
- f) The agriculture of the country will be diversified and stabilized. Diversification will protect the national economy from unstable banana and coffee markets, and will contribute to stabilizing the economic development of Honduras. Through the development of Western plain area, exports will increase of about US\$20.0 million per annum, and import substitution or foreign exchange saving will amount to US\$9 million in economic terms. This will contribute to improving the financial position of the country.
- g) Procurement of local materials for construction will have impacts in the industrial and commercial sectors of the country. It is particularly noted that procurement of cement for the gravity-type dam (about 100,000 t) and other structural works will greatly help the cement factory revive after its market falls sharply upon completion of El Cajon hydroelectric project.

h) The irrigated agriculture facilitated by the project will serve as a model for future agricultural development in the south region and for the country as a whole. The effect of its demonstration will be of great significance.

i) The San Fernando dam and reservoir will offer possibilities of development of tourism, because it is located relatively close to the metropolitan area where recreational facilities are relatively limited at present.

## XI. FINANCIAL EVALUATION

### 11.1 Capacity-to-Pay

The financial evaluation is made, in the first place, from the viewpoint of farm economy by examining the capacity-to-pay of a typical farm with land of 10 ha, and a typical cooperative with 20 members on 100 ha.

Under the irrigated farming practices proposed, it is estimated that a 10 ha farmer will earn a net return of Rp. 15,000 - 20,000 per annum, depending on the crops to be cultivated (See also Annex F.3.4). This net return at a farm level demonstrates a capacity-to-pay for water and/or other charges. Likewise, a typical cooperative will have a capacity-to-pay in the range of Rp. 88,000 - 107,000 per annum. It is assumed that farmers and cooperatives will pay for the operation and maintenance costs of irrigation and drainage facilities estimated at Rp. 105/ha. This would amount to only 5 - 7% of the net return of a typical small farmer or 10 - 12% of a typical cooperative. Thus, the farmers' economy will be greatly improved "with" the project, and even a small farmer will have an ample, capacity-to-pay water charge or operation and maintenance costs of irrigation facilities.

### 11.2 Financial Internal Rate of Return

Financial evaluation is further made by calculating a financial internal rate of return (FIRR) to examine the repayment capacity of capital investment. The evaluation by FIRR is made from the standpoint of the irrigation plan and the power generation plan.

The agricultural benefit in financial terms was estimated on the basis of revenue from the marketable surplus. The capital investment required for construction of the dam and irrigation facilities, as well as the operation and maintenance costs, will be considered as financial costs. Flows of benefits and costs for the irrigation plan

are shown in Table 11-1 and 11-2, from which FIRR was calculated to be 13.1% for the full scale development (20,600 ha in the Choluteca plain) and 11.7% for the first stage development (16,000 ha in the Western plain). This indicates that the investment in the dam and irrigation facilities will be financially viable.

FIRR of the power generation plan was calculated on the basis of power revenue, and power generation, transmission and distribution costs. The power revenue from sold energy is estimated by referring to ENEE's average revenue per kWh. Since water released for irrigation will be utilized for power generation and the scale of dam will be decided without regard to power generation, the cost of dam is not allocated to power generation in this financial study. The capital cost of power facilities, as well as operation and maintenance costs, were assessed in financial terms. As a consequence, flows of costs and revenue for power generation plan were prepared as shown in Table 11-3, from which FIRR is calculated to be 34.0%. Thus, installation of power plant at the San Fernando dam will be financially viable and highly profitable.

Combined flows of benefit and cost for power generation and irrigation of 16,000 ha are shown in Table 11-4. FIRR of the combined plan was estimated to be 13.5%.

## XII. IMPLEMENTATION PROGRAM

### 12.1 Stage-wise and Phased Implementation

Agricultural development of the Cholulteca plain is proposed for 20,600 ha (16,000 ha on the Western plain and 4,600 ha on the Eastern plain - A), together with construction of the San Fernando dam and reservoir. The proposed project may be implemented stage-wise. Further, the first stage development may possibly be phased, if the initial investment has to be reduced. A possible program for the stage-wise and phased implementation would be as follows:

- Stage-1: Phase 1-1 a) Irrigation of 12,400 ha on the right bank of the Cholulteca river on the Western plain
- b) Construction of San Fernando dam with effective storage of 380 MCM
- Phase 1-2 a) Extension of irrigation of 3,600 ha on the left bank of the Cholulteca river on the Western plain
- Stage-2: Phase 2-1 a) Irrigation of 4,600 ha on the Eastern plain - A

As evaluated in Chapter X, the implementation of stage-1 is economically justifiable. Further, the phased implementation of irrigation and drainage systems in the Western plain will also be acceptable from technical and economic points of view. It is noted that rehabilitation of the existing irrigation systems in the San Juan de Flores area (2,680 ha) and in the middle reach valley (680 ha) be separately executed, desirably in parallel with the stage-1 implementation in the Cholulteca plain.

Installation of the power plant and related facilities should, if possible, be scheduled to be carried out at the time of dam construction, but final scheduling of the power installation could be made after detailed designs have been prepared for the dam and power station.

## 12.2 Production and Net Return

Proposed agriculture in each stage of implementation has been discussed in Chapter IV, and it is tabulated in a summarized form as follows:

	Stage-1			Stage-2	Total
	Phase 1-1	1-2	Total		
Irrigation (ha)	12,400	3,600	16,000	4,600	20,600
Production (t)					
Sugar cane	856,000	-	856,000	-	856,000
Cotton	9,600	7,300	16,900	8,000	24,900
Paddy	12,600	7,600	20,200	11,500	31,700
Maize	5,100	3,900	9,000	10,400	19,400
Beans	3,700	2,000	5,700	4,600	10,300
Sesame	400	-	400	-	400
Melon	6,400	9,600	16,000	-	16,000
Water melon	1,300	1,100	2,400	-	2,400
Vegetable	34,200	13,800	48,000	-	48,000
Meat	30	-	30	-	30
Milk (k/)	40	-	40	-	40
Net Return (Ip.10 <sup>3</sup> )	29,598	8,593	38,191	11,327	49,518

It is also reiterated that employment in agriculture will be around 9,900 man-years under the stage-1 and 1,850 man-years under the stage-2. Resettlement of farmers will be additionally expected for 1,750 families in the stage-1 and 650 families in the stage-2.

### 12.3 Investment in Phase 1-1

For the implementation of phase 1-1, the requirement of investment will amount to Lp. 272.8 million in total, as summarized hereunder.

(Unit: LP.103)

	<u>Foreign Currency</u>	<u>Local Currency</u>	<u>Total</u>
San Fernando dam	65,277	24,740	90,017
Power station	12,774	2,719	15,493
Irrigation	51,395	15,202	60,597
(intake weir)	(8,483)	(3,105)	(11,588)
(canals)	(34,184)	(9,202)	(43,386)
(on-farm)	(8,728)	(2,895)	(11,623)
Land acquisition	-	4,000	4,000
Engineering & adm.	14,140	6,550	20,690
Physical contingency	14,360	5,322	19,682
Price contingency	39,254	17,076	56,330
Total	197,200	75,609	272,809

If the fund for power generation is raised separately, the funding requirement for phase 1-1 implementation will be Lp. 184.4 million (equivalent to US\$92.2 million) in foreign currency and Lp. 72.9 million (US\$36.4 million) in local currency.

### XIII. CONCLUSIONS AND RECOMMENDATIONS

Through the investigation and updating studies on the Choluteca River Basin Agricultural Development Project, it has been shown that the implementation of irrigation and drainage systems on the Choluteca plain over 20,600 ha (16,000 ha on the Western plain and 4,800 ha on the Eastern plain - A) together with construction of the San Fernando dam at its full scale, is technically sound, economically feasible and financially viable. The project will greatly contribute to i) increasing, diversifying and stabilizing agricultural production, ii) raising productivity and ensuring an increase in farmers' income, iii) promoting exports and improving the balance of payment, iv) creating and stabilizing employment opportunities, v) promoting agrarian reform programs, vi) achieving rural development and better balanced regional development, vii) generating electric power and save fuel consumption, viii) mitigating inundation by floods, and ix) achieving better utilization of land and water resources. The project will have economic and social impacts of major significance, as well as significant unquantified benefits. It is recommended that the proposed project be implemented as a national project at the earliest possible time.

For implementation of the project, it is also recommended that the following points be taken into consideration:

- 1) Stage-wise implementation will be recommendable. As the first stage, the San Fernando dam should be constructed to its full scale and irrigation and drainage systems on the Western plain (16,000 ha). The irrigation and drainage systems could be extended to the Eastern plain - A in a second stage. The first stage development is economically feasible on its own.
- 2) The first stage development can be phased into phase 1-1 and phase 1-2, if it should be necessary to reduce the initial investment. Phase 1-1 would cover the irrigation and drainage systems for 12,400 ha on the right bank of the Choluteca river.



on the Western plain. The remaining 3,600 ha on the left bank of the river would be implemented in phase 1-2.

- 3) It is recommended that detailed design of the project be initiated at the earliest possible date. For design, detailed geological, topographic and other surveys will be required.
- 4) Further study of the possibility of water supply from the San Fernando reservoir to the metropolitan area is recommended. Such a study should be initiated as soon as possible so as to be completed during the initial stage of detailed design of the San Fernando dam.
- 5) It is suggested that the water law and regulations be promulgated at the earliest possible date. Water charges for irrigation should be defined at the same time.
- 6) Development of irrigation systems on the Choluteca plain will induce and promote resettlement programs. It is recommended that a resettlement plan for the irrigable area be formulated by INA for integration into the Choluteca plain agricultural development project.
- 7) Watershed management in the Choluteca river basin is of vital significance for rational land and water resources development in the basin. The on-going management program in the upper sub-basin should be expanded to cover the catchment area at the San Fernando damsite.
- 8) Further contamination of water by untreated sewage in the metropolitan area will cause serious problem in the downstream. Desirably, some restrictions will be enacted to control water quality in the river. Such a control is particularly important for securing sources of potable water supply.

- 9) Training for irrigated farming is of great importance in a short and long run. It is desirable that systematic training will be executed by CEDA and La Lujosa training center for introduction and expansion of irrigated agriculture in the Choloteca plain and south region.
  
- 10) In parallel with the implementation of proposed dam and irrigation in the Choloteca plain, it is recommended to rehabilitate existing irrigation systems in the San Juan de Flores area and the middle reach valleys under a separate financial arrangement.



## **TABLES**



Table 1-1 PARTICIPANTS IN THE STUDY

HONDURAN COUNTERPARTS

Ing. Wilfredo Diaz Arrazola	Director General for Recursos Hídricos
Ing. Roberto Rivera Lanza	Subdirector General, DGRH, MRN
Lic. Jaime Lanza Fernández	DGRH
Ing. Pompilio Tinoco	DGRH
Lic. Carlos Rodríguez	DGRH
Ing. Orlando Avilés	DGRH
Ing. Patricio Rueda	DGRH
Ing. José Antonio Valle	DGRH
Ing. Miguel Turcios	DGRH
Ing. Roberto Dimas Alonzo	DGRH
Ing. Fernando Escobar	DGRH
Lic. Raf Flores	Encargado Planificación Sectorial, MRN
Ing. Marcelo Moncada	DPS, MRN
Lic. Carlos Aspra	DPS, MRN
Ing. Héctor Hernández	CONSUPLANE

ADVISORY COMMITTEE

Mr. Yusuke Suematsu	Committee Chief Ministry of Agriculture, Forestry and Fishery
Mr. Eiji Okano	Ministry of Agriculture, Forestry and Fishery
Mr. Hiroo Itoh	Overseas Economic Cooperation Fund

STUDY TEAM

Mr. Toshihito Ohtani	Team Leader, Irrigation Engineer Nippon Koei Co., Ltd.
Mr. Hajime Koizumi	Sub-Leader, Economist, Nippon Koei
Mr. Kiyonobu Kotani	Civil Engineer, Nippon Koei
Mr. Toshio Miyoshi	Irrigation Engineer, Nippon Koei
Mr. Makoto Ishizuka	Agronomist, Nippon Koei

Table 2-1 AREA AND POPULATION BY DEPARTMENT

Department	Area (km <sup>2</sup> )	Population in 10 <sup>3</sup>		
		1974 <sup>/1</sup>	1980 <sup>/2</sup>	1985 <sup>/3</sup>
Cholulteca	4,211	193	264	307
Atlántida	4,251	148	214	262
Colón	8,875	78	114	138
Comayagua	5,196	137	191	226
Copán	3,203	152	201	227
Cortés	3,954	370	543	683
El Paraíso	7,218	141	189	218
Fco. Marazán	7,946	453	657	792
Gracias Dios	16,630	21	31	39
Intibucá	3,072	82	105	116
Isl. Bahía	261	13	17	20
La Paz	2,331	66	83	89
Lempira	4,290	128	164	182
Octepeque	1,680	51	62	65
Olancho	24,351	151	207	243
Sta. Bárbara	5,115	186	260	305
Valle	1,565	92	118	131
Yoro	7,939	195	271	328
TOTAL	112,088	2,657	3,691	4,372

Notes: <sup>/1</sup>: Population Census  
<sup>/2</sup>: Estimated

Source: Anuario Estadístico 1982, DG de Estadística y Censos

Table 2-2 GROSS DOMESTIC PRODUCT BY SECTOR

	1975		1980		1983*	
	Lp.10 <sup>6</sup>	(%)	Lp.10 <sup>6</sup>	(%)	Lp.10 <sup>6</sup>	(%)
<u>At Current Price</u>						
Agric. forest fish	597	(26.6)	1,263	(25.4)	1,450	(24.6)
Mining	52	(2.3)	96	(1.9)	114	(1.9)
Manuf. industry	316	(14.1)	681	(13.7)	808	(13.7)
Construction	108	(4.8)	267	(5.4)	320	(5.4)
Elect. gas, water	36	(1.6)	98	(2.0)	128	(2.2)
Transp. & commun.	157	(7.0)	332	(6.7)	412	(7.0)
Commerce	239	(10.7)	587	(11.8)	692	(11.8)
Finance	82	(3.8)	218	(4.4)	252	(4.3)
Housing	153	(6.8)	297	(5.9)	377	(6.4)
Public services	66	(2.9)	197	(4.0)	276	(4.7)
Others	216	(9.6)	396	(7.9)	476	(8.1)
GDP at factor cost	2,022	(90.2)	4,432	(89.1)	5,305	(90.1)
Net indirect taxes	219	(9.8)	544	(10.9)	586	(9.9)
GDP at market price	2,241	(100.0)	4,976	(100.0)	5,891	(100.0)
<u>At 1966 Constant Price</u>						
Agric. forest, fish	389	(26.7)	539	(26.1)	565	(27.7)
Mining	33	(2.3)	38	(1.9)	39	(1.9)
Manuf. industry	195	(13.4)	295	(14.3)	276	(13.5)
Construction	54	(3.7)	77	(3.7)	75	(3.7)
Elect. gas, water	23	(1.6)	34	(1.6)	36	(1.8)
Transp. & communic.	97	(6.7)	120	(5.8)	126	(6.2)
Commerce	153	(10.5)	236	(11.4)	220	(10.8)
Finance	50	(3.4)	74	(3.6)	68	(3.3)
Housing	111	(7.6)	143	(6.9)	141	(6.9)
Public services	45	(3.1)	86	(4.2)	93	(4.5)
Others	163	(11.2)	197	(9.6)	183	(8.9)
GDP at factor cost	1,313	(90.2)	1,839	(89.1)	1,822	(89.2)
Net indirect taxes	142	(9.8)	226	(10.9)	220	(10.8)
GDP at market price	1,455	(100.0)	2,065	(100.0)	2,042	(100.0)

Note: \*Preliminary figures

Source: Cuenta Nacional de Honduras, Central Bank  
Bolletín Estadístico, Central Bank



Table 2-3 MAJOR EXPORTED COMMODITIES

	(Unit: Lp.106)				
	1978	1980	1981	1982	1983*
Banana	282.4	456.0	426.6	436.6	415.3
Coffee	422.0	408.2	345.7	306.2	302.4
Frozen meat	77.6	121.5	92.9	67.4	62.6
Shrimp & lobster	31.2	46.8	52.5	55.9	68.3
Sugar	11.0	58.7	93.1	44.5	55.7
Tobacco	2.8	27.4	26.7	21.5	22.0
Pine	13.5	15.6	14.2	17.6	n.a.
Cotton	31.1	26.9	24.9	13.0	9.4
Cigar	2.8	6.8	9.7	11.5	n.a.
Lumber	n.a.	72.4	86.3	89.3	79.3
Silver	21.9	63.5	31.5	18.6	49.5
Lead & zinc	45.3	39.8	41.3	32.4	58.5
Others	273.5	300.8	261.8	192.9	237.6
Total	1,215.1	1,644.2	1,507.2	1,307.4	1,360.6

Note: \* Preliminary figure

Source: Cuentos Nacionales de Honduras, Central Bank  
Boletín Estadístico, Central Bank

Table 2-4 CULTIVABLE AREA BY REGION

	Total Area (km <sup>2</sup> )	Arable Land (10 <sup>3</sup> ha)	Irrigable Land (10 <sup>3</sup> ha)	Irrigated Land, 1982 (10 <sup>3</sup> ha)
South (Choluteca)	6,583	232.6	57.0	7.7
North (Sula)	16,165	373.9	164.6	30.5
Central (Comayagua)	8,070	82.5	21.9	4.9
South Central (Teguc)	16,065	181.5	15.0	3.0
West (Copán)	10,139	82.7	4.5	0.0
South East (Olancho)	18,367	188.0	50.4	0.3
North East (Aguán)	15,610	396.7	51.5	8.0
East (Mosquitia)	21,089	1,262.1	35.1	-
Total	112,088	2,800.0	400.0	54.4

Source: National Plan for Water Resources, CONSUPLANE

Table 2-5. PRODUCTION OF MAJOR CROPS IN HONDURAS

(Unit: 10<sup>3</sup> tons)

Year	Banana	Maize	Sorghum	Rice	Beans	Coffee	Cotton	Sugar
1975	787	343	61	22	48	51	15	1,558
1976	1,084	378	64	23	43	50	9	1,647
1977	1,221	381	61	19	43	48	20	1,955
1978	1,240	420	61	24	44	64	32	2,094
1979	1,450	362	62	27	44	75	21	2,557
1980	1,426	366	62	29	45	73	25	2,868
1981	1,323	410	59	32	51	73	21	2,882
1982	1,432	404	58	35	49	73	18	3,055
1983*	1,188	409	62	39	52	86	8	3,153

Note: \* Preliminary figures

Source: Central Bank, July 1984

Table 2-6 PRODUCTION TARGET UNDER NATIONAL DEVELOPMENT PLAN

(Unit: 10<sup>3</sup> tons)

Crop	Production in 1980-82	Production* in 1982-83	Target for 1986	To be ** Increased
Banana	1,171	1,310	1,346	36
Maize	430	407	549	142
Sorghum	48	60	57	-
Rice	38	37	63	26
Beans	38	51	76	25
Coffee	70	80	75	-
Cotton	8	13	9	-
Sugar Cane	2,683	3,104	2,162	-
Sesame	0.7	-	1.2	0.5
Pineapple	151	-	373	222
Tomato	35	-	69	34
Water Melon	5.2	-	6.6	1.4
Melon	4.6	-	8.8	4.2

Note: \* Average annual production in 1982-83, Ref. Table  
 \*\* Production to be increased from 1982-83 (or 1980-82) to 1986.

Source: National Development Plan for Agricultural Sector,  
 CONSUPLANE

Table 3-1 ESTIMATED POPULATION IN CHOLUTECA PLAIN IN 1984

	Western Plain	Eastern Plain	Total or Average
Population <sup>/1</sup> (prs)	17,400	5,200	22,600
Household (nos)	3,300	1,200	4,500
Family size <sup>/2</sup> (prs)	5.3	4.5	5.0
Pop. density (prs/km <sup>2</sup> )	78	37	62
Farm population <sup>/3</sup> (prs)	14,700	4,400	19,100
Farm household (nos)	2,800	1,000	3,800
Work age pop. (prs)	7,000	2,100	9,100
Ave. labor force per farm household (prs)	2.5	2.1	2.4
Available agric. work <sup>/4</sup> force: (10 <sup>3</sup> man-days)			
per year	1,890	567	2,457
per month	158	47	205

Note: /1: Estimated at an annual growth rate of 3% in 1974-84  
 /2: 1974 census average is applied.  
 /3: Estimated at 84.5% of population  
 /4: Estimated at 270 workable days a year for the work  
 age population

Table 3--2 MONTHLY PRECIPITATION AT CHOLUJECA

(Unit: mm)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1943	0	0	0	50	287	241	168	464	379	764	19	5	2,376
1944	0	0	2	8	118	421	305	282	534	98	4	0	1,772
1945	0	0	0	2	243	325	202	239	409	350	49	4	1,823
1951	0	0	5	8	325	282	317	261	346	243	38	4	1,829
1952	0	0	4	124	215	580	137	248	336	396	34	0	2,074
1953	0	0	0	56	704	276	96	215	528	240	0	11	2,126
1954	0	0	16	75	304	559	147	239	409	350	49	4	2,157
1955	0	0	23	15	201	259	687	381	646	757	38	4	3,011
1956	0	0	0	50	406	295	116	278	459	409	16	0	2,029
1957	0	23	38	86	305	335	203	81	371	193	20	0	1,655
1958	0	8	56	145	432	462	158	83	566	292	48	15	2,220
1959	0	0	16	50	186	207	23	135	233	444	12	0	1,306
1960	1	0	0	46	326	453	205	356	272	514	42	0	2,215
1961	0	1	1	1	4	381	136	67	346	211	134	25	1,307
1962	0	0	20	65	206	474	202	206	379	353	49	4	1,958
1963	0	0	0	50	277	381	188	206	308	214	304	0	1,827
1964	0	15	1	72	113	492	268	242	433	188	14	8	1,846
1965	0	0	0	0	224	432	137	239	550	350	49	4	1,985
1966	0	0	3	35	298	651	201	93	398	296	7	11	1,993
1967	0	1	54	67	7	314	98	182	283	122	10	5	1,143
1968	0	0	0	13	504	584	77	131	571	483	54	1	2,418
1969	12	0	33	129	299	439	199	465	444	602	73	0	2,695
1970	0	0	0	71	265	201	469	430	488	281	79	2	2,286
1971	1	2	0	1	358	178	110	307	413	341	132	1	1,844
1972	0	0	97	30	320	224	194	180	131	261	55	0	1,492
1973	0	0	3	2	233	274	262	450	564	551	8	34	2,386
1974	0	0	0	0	211	370	29	168	520	117	44	1	1,460
1975	1	0	4	0	311	140	213	184	529	403	201	0	1,986
1976	0	0	0	172	134	337	32	76	125	339	41	0	1,256
1977	0	0	0	10	265	296	6	252	127	143	96	2	1,197
1978	3	8	5	18	398	171	232	78	434	178	73	20	1,618
1979	0	3	0	80	260	297	257	389	379	307	80	0	2,052
1980	4	0	1	9	391	201	171	150	549	361	114	0	1,951
1981	0	0	89	41	193	645	214	359	209	468	2	23	2,243
1982	31	23	5	117	893	204	23	0	323	164	31	6	1,820
1983	0	43	1	20	90	345	120	230	345	221	110	3	1,528
Mean	1	4	13	48	286	354	183	232	398	333	56	5	1,913

Table 3-3 DISCHARGE ESTIMATED AT EL PAPALON

C.A. = 7,115 km<sup>2</sup>

Year	(Unit: MCM)												
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1956													-
1957	44.1	29.7	22.4	21.1	146.8	228.1	46.0	62.5	238.1	201.4	64.4	36.0	1,109.4
1958	19.5	11.3	10.4	9.3	171.3	383.5	252.1	126.1	85.4	230.4	40.8	28.4	1,366.9
1959	22.2	14.7	10.1	7.7	49.9	83.2	22.2	49.6	46.5	240.8	44.1	23.5	608.7
1960	15.7	8.3	6.1	6.1	108.8	265.7	139.3	216.0	260.1	346.9	43.6	18.2	1,520.1
1961	34.0	27.3	21.4	17.0	15.0	164.1	174.9	90.0	143.6	163.5	107.9	39.2	990.9
1962	29.5	19.7	13.2	11.4	77.0	177.9	100.7	95.4	157.5	215.2	34.6	25.0	957.1
1963	21.8	13.4	12.2	11.5	10.3	97.8	105.4	56.1	134.9	232.5	174.7	30.3	900.9
1964	21.6	13.6	13.3	12.2	10.7	374.6	275.4	83.2	186.2	326.4	46.1	30.4	1,393.7
1965	13.5	5.9	5.7	4.9	94.0	149.3	61.0	56.9	411.2	314.2	96.4	37.3	1,250.3
1966	26.0	16.0	14.2	19.1	196.2	484.1	319.5	134.3	201.6	427.4	69.3	39.1	1,946.8
1967	29.3	21.1	18.3	37.8	15.5	110.1	60.4	49.5	179.1	124.8	42.0	24.1	712.0
1968	21.2	13.6	9.2	9.0	160.0	621.9	109.9	74.7	365.5	362.9	124.3	47.3	1,919.5
1969	40.9	16.9	14.9	12.9	61.3	662.5	216.1	560.5	656.6	902.9	199.5	53.9	3,398.9
1970	26.6	12.9	9.4	10.1	38.3	37.2	141.9	282.9	547.8	401.7	124.9	51.1	1,684.8
1971	33.3	21.7	17.3	13.7	80.0	59.0	36.7	124.4	356.1	395.0	76.5	35.6	1,249.3
1972	24.1	15.7	10.9	9.7	55.8	150.2	25.7	31.7	32.2	36.6	22.8	13.4	428.8
1973	10.2	6.1	4.7	6.3	37.5	99.9	108.6	81.1	268.4	661.2	190.2	39.9	1,514.1
1974	20.8	10.1	7.9	7.1	266.8	229.2	115.4	117.7	567.2	373.7	82.8	24.3	1,823.0
1975	14.0	7.7	7.5	7.5	31.2	9.8	37.9	57.1	661.3	607.7	419.5	82.4	1,943.6
1976	27.7	15.4	9.6	8.2	73.3	1,016.2	211.1	47.2	35.1	603.4	61.3	55.6	2,164.1
1977	29.7	22.7	19.4	21.0	63.1	202.9	34.9	33.6	80.4	46.1	34.7	23.7	612.2
1978	22.0	18.0	15.5	22.5	92.7	177.2	176.8	60.4	288.0	87.8	33.5	40.4	1,034.8
1979	23.2	15.5	15.5	33.7	84.4	359.7	168.1	102.3	534.0	592.7	154.7	65.2	2,149.0
1980	33.1	13.9	7.5	20.8	259.7	509.2	164.2	169.8	352.4	1,004.8	124.9	77.3	2,737.6
1981	44.6	30.5	27.2	17.2	96.2	1,037.3	193.0	188.9	404.3	157.0	63.2	42.4	2,301.8
1982	20.9	34.6	36.9	28.6	142.3	289.9	95.6	61.0	103.0	208.5	49.9	188.3	1,259.5
1983	26.3	20.0	15.7	23.1	26.2	103.0	75.8	63.8	172.9	312.1	129.6	66.7	1,035.2
Mean	25.8	16.9	13.9	15.2	91.3	299.4	128.5	114.0	276.6	354.7	98.6	45.5	1,480.4
Max.	44.6	34.6	36.9	33.7	266.8	1,037.3	319.5	560.5	661.3	1,004.8	419.5	188.3	3,398.9
Min.	10.2	5.9	4.7	4.9	10.3	9.8	22.2	31.7	32.2	36.6	22.8	13.4	612.2
(m <sup>3</sup> /s)													
Mean	9.6	7.0	5.2	5.9	34.1	115.5	48.0	42.6	106.7	132.4	38.0	17.0	17.0
Max.	16.7	14.3	13.8	13.0	99.6	400.2	119.3	209.3	255.1	375.1	161.8	70.3	70.3
Min.	3.8	2.4	1.8	1.9	3.8	3.8	8.3	11.8	12.4	13.7	8.8	5.0	5.0

Table 3-4 SOILS IN CHOLUJECA PLAIN

Classification Order/Sub-Group	Topography	Western Plain		Eastern Plain		Total	
		Ha	(%)	Ha	(%)	Ha	(%)
Inceptisols: Fluventic Ustropepts	alluvial plain	410	(1.8)	180	(1.3)	560	(1.6)
Entisols: Typic Ustifluent	alluvial plain	2,770	(12.4)	690	(5.1)	3,460	(9.7)
Mollisols Fluventic Haplustolls Aquic Haplustolls Fluvaquentic Haplustolls	alluvial plain	15,960	(71.3)	180	(1.3)	16,140	(44.8)
Alfisols: Aquic Haplustalfs Vertic Tropaqualfs	terraces	620	(2.8)	10,930	(80.4)	11,550	(32.1)
Vertisols: Typic Pollusterfs	terraces	1,410	(6.3)	290	(2.1)	1,700	(4.7)
Ultisols: Udic Paleustalfs	terraces	-	-	320	(2.4)	320	(0.7)
Alfisols: Udic Haplustalfs	hill masses	300	(1.3)	790	(5.8)	1,090	(3.0)
-	water	930	(4.1)	220	(1.6)	1,150	(3.2)
Total		22,400	(100.0)	13,600	(100.0)	36,000	(100.0)



Table 3-5 LAND CAPABILITY CLASSIFICATION IN  
CHOLUTECA PLAIN

Class	Western Plain		Eastern Plain		Total	
	Ha	(%)	Ha	(%)	Ha	(%)
I	6,740	(30.0)	110	(0.8)	6,850	(19.0)
II	6,750	(30.1)	1,420	(10.4)	8,170	(22.7)
III	7,590	(33.9)	9,350	(68.8)	16,940	(47.0)
IV	130	(0.6)	2,200	(16.2)	2,330	(6.5)
VI	260	(1.2)	300	(2.2)	560	(1.6)
Water and others	930	(4.2)	220	(1.6)	1,150	(3.2)
Total	22,400	(100.0)	13,600	(100.0)	36,000	(100.0)

Table 3-6 PRESENT LAND USE

Land Capacity	Western Plain		Eastern Plain		Total Area	
	Area (ha)	%	Area (ha)	%	Area (ha)	%
A) <u>Agricultural Land</u>						
A.1) Upland field						
- Sugar cane	9,060	(40.5)	520	(3.8)	9,580	(26.6)
- Cotton	260	(1.2)	100	(0.7)	360	(1.0)
- Rotation of other upland crops	1,750	(7.8)	240	(1.8)	1,990	(5.5)
A.2) Paddy field	50	(0.2)	810	(6.0)	860	(2.4)
A.3) Pasture land	6,310	(28.2)	5,250	(38.6)	11,560	(32.1)
A.4) Forest land	2,250	(10.0)	4,440	(32.7)	6,690	(18.6)
Sub-total	19,680	(87.9)	11,360	(83.5)	31,040	(86.2)
B) <u>Non-agricultural Land</u>						
B.1) Bush and scrub land	270	(1.2)	340	(2.5)	610	(1.7)
B.2) Village yard	430	(1.9)	290	(2.1)	720	(2.0)
B.3) Road/Rivers/Others	2,020	(9.0)	1,610	(11.8)	3,630	(10.0)
Total	22,400	(100.0)	13,600	(100.0)	36,000	(100.0)

Table 3-7 PRESENT AGRICULTURAL PRODUCTION

Crop	Average Yield (t/ha)	Western Plain		Eastern Plain		Total Production (ton)
		Area (ha)	Production (ton)	Area (ha)	Production (ton)	
Sugar cane			<u>612,840</u>		<u>36,450</u>	<u>649,290</u>
Estate	73.0	3,180	232,130	-	-	232,140
Outgrowers'	81.0	4,700	380,700	450	36,450	417,150
Cotton	2.3	230	530	90	210	740
Maize			<u>1,960</u>		<u>370</u>	<u>2,330</u>
Semi-mecha.	2.0	850	1,700	160	320	2,020
Traditional	1.3	200	260	40	50	310
Sorghum			<u>170</u>		<u>-</u>	<u>170</u>
Semi-mecha.	1.9	50	100	-	-	100
Traditional	1.0	70	70	-	-	70
Paddy			<u>360</u>		<u>6,300</u>	<u>6,600</u>
Wet season	4.5	40	180	700	3,150	3,330
Dry season	4.5	40	180	700	3,150	3,330
Sesame	0.7	150	110	20	10	120
Melon	5.2	1,080	5,620	30	160	5,780
Water melon	8.0	70	560	-	-	560
Livestock						
Milk	190 <sup>l</sup>	8,560	1,630 <sup>kl</sup>	9,690	1,840 <sup>kl</sup>	3,470 <sup>kl</sup>
Meat	130 <sup>kg</sup>	8,560	1,110	9,690	1,260	2,370

Table 3-8 ESTIMATED RETURN FROM AGRICULTURAL PRODUCTION  
(WITHOUT PROJECT)

Crop	Net Return (Lp./ha)	Western Plain		Eastern Plain		Total Return (10 <sup>3</sup> Lp.)
		Area (ha)	Return (10 <sup>3</sup> Lp.)	Area (ha)	Return (10 <sup>3</sup> Lp.)	
Sugar cane						
Estate	782	3,180	2,487	-	-	2,487
Outgrower	1,607	6,070	9,754	450	723	10,477
Cotton	728	740	539	150	109	648
Maize						
Semi-mech.	240	1,050	252	200	48	300
Traditional	-	-	-	-	-	-
Sorghum						
Semi-mech.	156	120	19	-	-	19
Traditional	-	-	-	-	-	-
Paddy	997	80	80	1,400	1,396	1,476
Sesame	323	150	48	20	6	54
Melon	1,122	1,200	1,346	30	34	1,380
Water melon	861	70	60	-	-	60
Livestock	132	6,830	902	9,630	1,271	2,173
<b>TOTAL</b>			<b>15,487</b>		<b>3,587</b>	<b>19,074</b>

Table 4-1 PROPOSED LAND USE

Land Category	Western Plain		Eastern Plain				Total			
	Area (ha)	%	A		B		Area (ha)	%		
			Area (ha)	%	Area (ha)	%				
A) Agricultural Land										
A.1) Upland field	11,810	(52.7)	2,300	(34.3)	2,200	(31.9)	4,500	(33.1)	16,310	(45.3)
A.2) Paddy field	4,050	(18.1)	2,300	(34.3)	1,000	(14.5)	3,300	(24.3)	7,350	(20.4)
A.3) Pasture/Forest	140	(0.6)	-	(-)	2,000	(29.0)	2,000	(14.7)	2,140	(5.9)
Sub-total	16,000	(71.4)	4,600	(68.7)	5,200	(75.4)	9,800	(72.1)	25,800	(71.7)
B) Non-agricultural Land										
B.1) Village yard	430	(1.9)	110	(1.6)	180	(2.6)	290	(2.1)	720	(2.0)
B.2) Road/Rivers/Others	5,970	(26.7)	1,990	(29.7)	1,520	(22.0)	3,510	(25.8)	9,480	(26.3)
Sub-total	6,400	(28.6)	2,100	(31.3)	1,700	(24.6)	3,800	(27.9)	10,200	(28.3)
Total	22,400	(100.0)	6,700	(100.0)	6,900	(100.0)	13,600	(100.0)	36,000	(100.0)

Note: All the figures are indicated in net areas.

Table 4-2 CROPPING AREA UNDER "WITH" PROJECT

(Unit: ha)

Crop	Western Plain	Eastern Plain			Total
		A	B	Total	
1. Sugar cane	6,980	-	-	-	6,980
Estate	3,180	-	-	-	3,180
Outgrowers	3,670	-	-	-	3,670
Seed cane	130	-	-	-	130
2. Cotton	4,830	2,300	2,200	4,500	9,330
3. Paddy	4,050	2,300	1,000	3,300	7,350
4. Maize	2,000	2,300	1,600	3,900	5,900
5. Beans	2,830	2,300	1,600	3,900	6,730
6. Sesame	250	-	-	-	250
7. Melon	2,000	-	-	-	2,000
8. Water melon	200	-	-	-	200
9. Vegetables	1,600	-	-	-	1,600
10. Pasture	140	-	2,000	2,000	2,140
Total	24,880	9,200	8,400	17,600	42,480

Table 4-3 PRODUCTION UNDER "WITH" PROJECT

Crop	Average Yield (t/ha)	Western Plain		Eastern Plain				Total	
		Plain		A		B		Total	
		Area Production (ha)	(ton)	Area Production (ha)	(ton)	Area Production (ha)	(ton)	Area Production (ha)	(ton)
1. Sugar Cane									
Estate	125.0	3,180	397,500	-	-	-	-	-	6,850 856,250
Outgrowers	125.0	3,670	458,750	-	-	-	-	-	3,180 397,500 3,670 458,750
2. Cotton	3.5	4,830	16,910	2,300	8,050	2,200	7,700	4,500	15,750 9,330 32,660
3. Paddy	5.0	4,050	20,250	2,300	11,500	1,000	5,000	3,300	16,500 7,350 36,750
4. Maize	4.5	2,000	9,000	2,300	10,350	1,600	7,200	3,900	17,550 5,900 26,550
5. Beans	2.0	2,830	5,660	2,300	4,600	1,600	3,200	3,900	7,800 6,730 13,460
6. Sesame	1.5	250	380	-	-	-	-	-	250 380
7. Melon	8.0	2,000	16,000	-	-	-	-	-	2,000 16,000
8. Water melon	12.0	200	2,400	-	-	-	-	-	200 2,400
9. Vegetables	30.0	1,600	48,000	-	-	-	-	-	1,600 48,000
10. Livestock									
Meat	0.195	140	30	-	-	2,000	390	2,000	390 2,140 420
Milk (k/)	0.285	140	40	-	-	2,000	570k/	2,000	570k/ 2,140 610k/

Table 4-4 ESTIMATED RETURN FROM AGRICULTURAL PRODUCTION (WITH PROJECT)

Crop	Net Return (Rp./ha)	Western Plain		Eastern Plain				Total Return (Rp.103)
		A		B		Total		
		Area (ha)	Return (Rp.103)	Area (ha)	Return (Rp.103)	Area (ha)	Return (Rp.103)	
Sugar cane			12,146					12,146
Estate farm	1,658	3,180	5,272	-	-	-	-	5,272
Outgrowers'	1,873	3,670	6,874	-	-	-	-	6,874
Cotton	1,601	4,830	7,733	2,300	3,682	2,200	3,522	7,204
Maize	597	2,000	1,194	2,300	1,373	1,600	955	2,328
Beans	1,279	2,830	3,620	2,300	2,942	1,600	2,046	4,988
Paddy	1,448	4,050	5,864	2,300	3,330	1,000	1,448	4,778
Sesame	902	250	226	-	-	-	-	226
Melon	2,789	2,000	5,578	-	-	-	-	5,578
Water melon	1,035	200	207	-	-	-	-	207
Vegetables	998	1,600	1,597	-	-	-	-	1,597
Livestock	189	140	26	-	-	2,000	378	2,000 378 404
Total			38,191		11,327		8,349	19,676
						2,000		57,867



Table 4-5 POSSIBILITY OF RESETTLEMENT

	(Unit: persons)								
	Present Cooperative Member	Monjaras - Buena Vista		Ola		Settlers in Expropriated Area			
		Present Settlers	New Settlers	Present Settlers	New Settlers				
Western Plain	270	450	110	560	280	420	700	490	2,020
Eastern Plain									
A	10	-	-	-	-	-	-	650	660
B	60	-	-	-	20	30	50	470	580
Sub-total	70	-	-	-	20	30	50	1,120	1,240
Total	340	450	110	560	300	450	750	1,610	3,260

Table 5-1 DISCHARGE ESTIMATED AT SAN FERNANDO DAMSITE

(C.A. = 1,665 km<sup>2</sup>)

(Unit: MCM)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1954								38.6	207.0	172.0	20.4	8.4	-
1955	6.9	6.2	6.1	5.7	5.3	7.4	128.0	71.8	137.0	246.0	58.6	21.0	700.0
1956	12.1	8.5	6.0	5.6	15.2	94.4	51.7	16.4	41.9	38.5	15.6	13.5	319.4
1957	13.3	8.1	5.9	5.4	29.9	80.3	19.6	20.6	53.7	43.4	11.2	10.1	301.5
1958	6.1	4.0	3.9	3.2	66.4	144.0	65.4	34.0	27.0	66.8	10.6	8.0	439.4
1959	8.2	5.9	4.8	4.1	25.4	38.4	13.2	24.8	20.1	58.2	17.7	11.2	232.0
1960	5.3	3.9	3.5	3.3	14.6	111.0	20.3	42.2	93.7	131.0	18.6	11.0	458.4
1961	10.4	8.4	7.3	5.7	5.9	25.1	32.1	16.6	41.8	33.0	30.7	12.2	229.2
1962	11.6	7.6	6.0	5.6	22.4	68.2	18.6	34.2	73.7	137.0	13.0	11.5	409.4
1963	8.6	6.0	5.2	4.8	4.7	26.7	32.0	13.1	32.7	48.8	45.1	6.6	234.3
1964	5.4	3.9	3.7	3.3	3.1	90.6	111.0	16.1	58.2	74.6	7.6	6.2	383.7
1965	2.8	3.0	1.9	1.6	22.8	45.7	17.6	12.2	263.0	83.2	37.6	13.3	504.7
1966	7.9	4.8	4.9	4.7	51.4	85.6	78.8	28.0	41.6	67.0	13.5	8.4	396.6
1967	7.2	5.5	4.8	11.1	3.7	14.1	15.1	10.0	34.9	35.1	10.6	6.1	158.2
1968	4.8	2.9	2.0	1.9	55.1	170.0	29.4	23.3	92.1	68.3	40.0	12.7	502.5
1969	10.2	4.1	3.2	2.0	17.9	217.0	77.0	138.0	193.0	216.0	41.0	22.7	942.1
1970	10.3	6.6	4.1	8.6	16.4	21.2	53.8	97.0	187.0	80.4	30.3	15.4	531.1
1971	7.2	4.9	3.4	3.0	25.0	17.8	17.1	43.4	109.0	102.0	19.7	8.3	360.8
1972	5.9	3.4	2.3	2.6	14.8	40.1	8.2	8.9	10.3	9.0	5.0	3.5	114.0
1973	3.4	3.0	3.2	3.0	18.4	48.4	45.9	31.1	94.6	186.0	43.0	10.4	490.4
1974	6.4	5.4	4.8	3.4	92.5	44.4	20.5	8.9	111.4	42.4	12.8	10.5	363.4
1975	9.7	6.9	5.2	3.8	15.2	8.5	17.6	5.5	234.3	164.0	187.0	13.4	671.1
1976	9.0	6.4	5.4	5.2	8.8	175.3	42.6	11.1	8.0	69.4	13.0	12.0	366.2
1977	6.3	4.1	3.3	3.8	18.2	88.7	10.0	8.6	18.7	11.1	9.5	5.5	187.8
1978	4.5	3.8	2.9	3.9	21.2	38.5	38.1	15.9	60.4	21.9	8.5	10.1	229.7
1979	5.4	3.6	3.6	7.9	23.8	84.4	60.6	32.0	127.6	126.5	25.3	14.8	515.5
1980	7.7	4.7	3.4	3.7	26.0	130.4	54.7	45.9	79.3	94.3	17.3	12.7	480.1
1981	6.6	7.0	9.0	4.0	22.6	133.5	60.1	73.0	94.6	36.7	14.8	9.9	471.8
1982	4.9	8.1	8.6	6.7	29.9	71.5	20.2	18.6	29.9	62.8	17.0	12.6	290.8
1983	10.4	6.8	7.2	6.7	5.7	40.0	41.5	22.4	63.7	70.9	37.8	15.6	328.7
Mean	7.6	5.4	4.6	4.6	23.6	74.5	41.4	32.1	88.0	86.5	27.8	11.3	400.5
(m <sup>3</sup> /s)	2.8	2.2	1.7	1.7	8.8	28.7	15.5	12.0	34.0	32.3	10.7	4.2	

Table 5-2 DIVERSION WATER REQUIREMENT

(Unit: 10<sup>3</sup>m<sup>3</sup>)

Area	(Ha)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1) Western Plain	(16,000)	39,952	32,352	47,936	54,192	8,832	1,456	18,320	6,032	208	336	26,336	51,328	287,280
2) Middle Reach	(680)	2,450	3,071	4,226	3,329	992	158	544	65	0	1,874	2,349	3,330	22,388
3) S.J. Flores	(2,680)	3,457	3,508	5,333	3,578	1,914	86	2,200	2,021	874	994	2,278	2,224	28,467
Total (1-3)	(19,360)	45,859	38,931	57,495	61,099	11,738	1,700	21,064	8,118	1,082	3,204	30,963	56,882	338,135
4) Eastern Plain														
- A	(4,600)	11,196	7,457	15,691	20,985	5,028	805	4,002	0	0	483	6,081	15,658	87,386
Total (1-4)	(23,960)	57,055	46,388	73,186	82,084	16,766	2,505	25,066	8,118	1,082	3,687	37,044	72,540	425,521
5) Eastern Plain														
- B	(5,200)	15,371	11,263	15,241	18,252	2,345	338	5,169	1,425	0	208	9,121	18,689	97,422
Total (1-5)	(29,160)	72,426	57,651	88,427	100,336	19,111	2,843	30,235	9,543	1,082	3,895	46,165	91,229	522,943

Table 5-3 REQUIRED RELEASE FOR IRRIGATION (23,960 HA)

YEAR	REQUIRED RELEASE FOR IRRIGATION												UNIT : MCM
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
1957	26.3	24.8	56.7	66.4	1.9	0.1	2.2	2.0	0.9	1.0	7.5	54.2	
1958	43.7	39.1	66.7	76.0	1.9	0.1	2.2	2.0	0.9	1.0	3.5	57.0	
1959	43.1	37.6	67.9	78.5	1.9	0.1	16.1	2.0	0.9	1.0	11.1	65.5	
1960	46.7	42.0	70.6	79.3	1.9	0.1	2.2	2.0	0.9	1.0	2.3	44.3	
1961	33.5	27.5	59.1	70.8	7.7	0.1	2.2	2.0	0.9	1.0	2.3	50.5	
1962	39.2	34.3	66.0	76.3	1.9	0.1	2.2	2.0	0.9	1.0	15.5	59.0	
1963	43.9	39.0	66.2	75.4	11.2	0.1	2.2	2.0	0.9	1.0	2.3	48.8	
1964	40.9	36.7	63.6	73.2	9.2	0.1	2.2	2.0	0.9	1.0	2.3	48.3	
1965	46.4	43.5	69.4	78.8	1.9	0.1	2.2	2.0	0.9	1.0	2.3	48.5	
1966	39.0	35.2	63.9	67.7	1.9	0.1	2.2	2.0	0.9	1.0	2.3	41.8	
1967	35.0	30.8	59.7	55.4	5.0	0.1	2.2	2.0	0.9	1.0	5.6	54.5	
1968	40.7	35.7	66.0	75.0	1.9	0.1	2.2	2.0	0.9	1.0	2.3	37.9	
1969	26.4	33.6	61.5	71.2	1.9	0.1	2.2	2.0	0.9	1.0	2.3	41.3	
1970	40.8	40.1	67.9	80.6	1.9	0.1	2.2	2.0	0.9	1.0	2.3	36.8	
1971	31.0	29.6	59.3	71.4	1.9	0.1	5.5	2.0	0.9	1.0	2.3	45.2	
1972	38.9	34.1	64.6	75.0	1.9	0.1	7.6	2.0	0.9	1.0	19.3	62.6	
1973	50.3	43.3	71.7	78.8	1.9	0.1	2.2	2.0	0.9	1.0	2.3	43.0	
1974	42.7	41.7	70.1	78.4	1.9	0.1	2.2	2.0	0.9	1.0	2.3	58.7	
1975	52.8	45.6	70.9	78.4	1.9	1.2	4.8	2.0	0.9	1.0	2.3	3.5	
1976	38.4	37.4	69.0	79.1	1.9	0.1	2.2	2.0	0.9	1.0	2.3	28.9	
1977	33.7	27.8	57.1	64.9	1.9	0.1	2.2	2.0	0.9	1.0	11.8	54.3	
1978	39.6	32.2	60.6	63.5	1.9	0.1	2.2	2.0	0.9	1.0	12.0	42.2	
1979	39.3	34.5	61.3	56.3	1.9	0.1	2.2	2.0	0.9	1.0	2.3	22.1	
1980	31.7	37.2	69.1	65.0	1.9	0.1	2.2	2.0	0.9	1.0	2.3	7.9	
1981	19.1	22.9	55.0	68.9	1.9	0.1	2.2	2.0	0.9	1.0	2.3	40.0	
1982	41.1	19.9	44.9	60.2	1.9	0.1	2.2	2.0	0.9	1.0	4.1	2.2	
1983	41.2	33.2	64.7	65.7	1.9	0.1	2.2	2.0	0.9	1.0	2.3	21.4	

MAXIMUM IRRIGATION DISCHARGE (MCM) : 80.6

Table 5-4 RESULT OF RESERVOIR OPERATION

		Case 1-1	Case 1-2	Case 2-1	Case 2-2	Case 3
Irrigation Area	(ha)	19,360	19,360	23,960	23,960	29,160
Water Supply	(m <sup>3</sup> /s)	-	1.0	-	1.0	-
Storage Capacity	(MCM)	200.5	207.2	354.0	387.6	737.5
Full Supply Level	(EL)	817.6	818.0	825.1	826.6	843.2
Min. Operating Level	(EL)	797.0	797.0	797.0	797.0	707.0
Max. Discharge	(m <sup>3</sup> /s)	21.8	31.9	32.1	32.2	43.4
Power Capacity*	(MW)	7.1	7.0	10.9	11.1	15.8
Annual Energy	(GWh)	45.2	43.4	55.4	53.6	63.4

Note: \*: Average capacity during the period from December to April.

Table 9-1 SUMMARY OF COST ESTIMATE  
(Dam, Power and Irrigation 23,960 ha)

Description	(Unit: Ip.10 <sup>3</sup> )		
	Foreign Currency Component	Local Currency Component	Total
1. SAN FERNANDO DAM AND POWER STATION			
1.1 Access road and preparatory works	5,368	3,191	8,559
1.2 River diversion works	3,720	1,170	4,890
1.3 Dam and spillway	50,369	18,241	68,610
1.4 Intake, penstock and outlet	700	58	758
1.5 Powerhouse and tail race	2,372	1,133	3,505
1.6 Generating equipment	9,272	736	10,008
1.7 Transmission line and sub-station	1,130	850	1,980
1.8 Highway relocation	<u>5,120</u>	<u>2,080</u>	<u>7,200</u>
Sub-total	78,051	27,459	105,510
2. CHOLUTECA PLAIN IRRIGATION SYSTEM			
2.1 Preparatory works	1,937	1,467	3,404
2.2 Intake weir	13,974	3,716	17,690
2.3 Main canal	15,486	3,925	19,411
2.4 Branch canal	27,565	7,560	35,125
2.5 Secondary canal	2,714	1,052	3,766
2.6 Drainage canal	5,154	1,371	6,525
2.7 Farm road	7,570	2,206	9,776
2.8 On-farm construction	4,297	1,605	5,902
2.9 Clearing and reclamation	<u>10,175</u>	<u>3,416</u>	<u>13,591</u>
Sub-total	88,872	26,318	115,190
3. IRRIGATION IN MIDDLE REACH	4,900	1,062	5,962
4. LAND COMPENSATION	-	8,750	8,750
5. ENGINEERING AND ADMINISTRATION	17,640	8,857	26,497
6. CONTINGENCIES			
6.1 Physical contingency	18,948	7,246	26,194
6.2 Price contingency	<u>61,077</u>	<u>27,657</u>	<u>88,734</u>
Sub-total	80,025	34,903	114,928
Total	269,488	107,349	376,837

Table 9-2 SUMMARY OF COST ESTIMATE  
(Dam, Power and Irrigation 20,600 ha)

Description	(Unit: Lp.10 <sup>3</sup> )		
	Foreign Currency Component	Local Currency Component	Total
<b>1. SAN FERNANDO DAM AND POWER STATION</b>			
1.1 Access road and preparatory works	5,368	3,191	8,559
1.2 River diversion works	3,720	1,170	4,890
1.3 Dam and spillway	50,369	18,241	68,610
1.4 Intake, penstock and outlet	700	58	758
1.5 Powerhouse and tail race	2,372	1,133	3,505
1.6 Generating equipment	9,272	736	10,008
1.7 Transmission line and sub-station	1,130	850	1,980
1.8 Highway relocation	5,120	2,080	7,200
Sub-total	78,051	27,459	105,510
<b>2. CHOLUTECA PLAIN IRRIGATION SYSTEM</b>			
2.1 Preparatory works	1,937	1,467	3,404
2.2 Intake weir	13,974	3,716	17,690
2.3 Main canal	15,486	3,925	19,411
2.4 Branch canal	27,565	7,560	35,125
2.5 Secondary canal	2,714	1,052	3,766
2.6 Drainage canal	5,154	1,371	6,525
2.7 Farm road	7,570	2,206	9,776
2.8 On-farm construction	4,297	1,605	5,902
2.9 Clearing and reclamation	10,175	3,416	13,591
Sub-total	88,872	26,318	115,190
3. LAND COMPENSATION	-	8,750	8,750
4. ENGINEERING AND ADMINISTRATION	17,150	8,750	25,900
<b>5. CONTINGENCIES</b>			
5.1 Physical contingency	18,409	7,128	25,537
5.2 Price contingency	61,077	27,657	88,734
Sub-total	79,486	34,785	114,271
<b>Total</b>	<b>263,559</b>	<b>106,062</b>	<b>369,621</b>

Table 9-3 SUMMARY OF COST ESTIMATE  
(Dam, Power and Irrigation 16,000 ha)

Description	(Unit: Lp.103)		
	Foreign Currency Component	Local Currency Component	Total
<b>1. SAN FERNANDO DAM AND POWER STATION</b>			
1.1 Access road and preparatory works	5,368	3,191	8,559
1.2 River diversion works	3,720	1,170	4,890
1.3 Dam and spillway	50,369	18,241	68,610
1.4 Intake, penstock and outlet	700	58	758
1.5 Powerhouse and tail race	2,372	1,133	3,505
1.6 Generating equipment	9,272	736	10,008
1.7 Transmission line and sub-station	1,130	850	1,980
1.8 Highway relocation	<u>5,120</u>	<u>2,080</u>	<u>7,200</u>
Sub-total	78,051	27,459	105,510
<b>2. CHOLUTECA PLAIN IRRIGATION SYSTEM</b>			
2.1 Preparatory works	1,495	1,248	2,743
2.2 Intake weir	6,987	1,858	8,845
2.3 Main canal	12,941	3,261	16,202
2.4 Branch canal	18,348	5,009	23,357
2.5 Secondary canal	2,714	1,052	3,766
2.6 Drainage canal	4,559	1,185	5,744
2.7 Farm road	5,328	1,563	6,891
2.8 On-farm construction	3,350	1,248	4,598
2.9 Clearing and reclamation	<u>8,259</u>	<u>2,873</u>	<u>11,132</u>
Sub-total	63,981	19,297	83,278
3. LAND COMPENSATION	-	4,690	4,690
4. ENGINEERING AND ADMINISTRATION	15,600	7,600	23,200
<b>5. CONTINGENCIES</b>			
5.1 Physical contingency	15,764	5,907	21,671
5.2 Price contingency	<u>44,774</u>	<u>19,680</u>	<u>64,458</u>
Sub-total	60,538	25,587	86,129
<b>Total</b>	<b>218,170</b>	<b>84,633</b>	<b>302,803</b>



Table 9-4 SUMMARY OF COST ESTIMATE  
(Dam, Power and Irrigation 12,400 ha)

Description	(Unit: Lp.103)		Total
	Foreign Currency Component	Local Currency Component	
<b>1. SAN FERNANDO DAM AND POWER STATION</b>			
1.1 Access road and preparatory works	5,368	3,191	8,559
1.2 River diversion works	3,720	1,170	4,890
1.3 Dam and spillway	50,369	18,241	68,610
1.4 Intake, penstock and outlet	700	58	758
1.5 Powerhouse and tail race	2,372	1,133	3,505
1.6 Generating equipment	9,272	736	10,008
1.7 Transmission line and sub-station	1,130	850	1,980
1.8 Highway relocation	5,120	2,080	7,200
Sub-total	78,051	27,459	105,510
<b>2. CHOLUTECA PLAIN IRRIGATION SYSTEM</b>			
2.1 Preparatory works	1,495	1,248	2,743
2.2 Intake weir	6,988	1,857	8,845
2.3 Main canal	12,943	3,262	16,205
2.4 Branch canal	15,968	4,373	20,341
2.5 Secondary canal	1,841	674	2,515
2.6 Drainage canal	3,432	893	4,325
2.7 Farm road	3,495	1,017	4,512
2.8 On-farm construction	2,345	874	3,219
2.9 Clearing and reclamation	2,888	1,004	3,892
Sub-total	51,395	15,202	66,597
3. LAND COMPENSATION	-	4,000	4,000
4. ENGINEERING AND ADMINISTRATION	14,140	6,550	20,690
<b>5. CONTINGENCIES</b>			
5.1 Physical contingency	14,360	5,322	19,682
5.2 Price contingency	39,254	17,076	56,330
Sub-total	53,614	22,398	76,012
<b>Total</b>	<b>197,200</b>	<b>75,609</b>	<b>272,809</b>

Table 9-5 DISBURSEMENT SCHEDULE (FINANCIAL)

Dam and Irrigation 20,600 ha

Items	1st (1985)		2nd (1986)		3rd (1987)		4th (1988)		5th (1989)		6th (1990)		7th (1991)		8th (1992)	
	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C
1. Dam Works	-	-	630	450	6,199	2,873	11,557	3,786	25,888	10,363	21,029	7,217	-	-	-	-
2. Power Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Irrigation Systems	-	-	-	-	6,502	2,324	28,304	8,462	14,815	4,213	10,927	3,283	3,557	1,124	3,715	1,038
Sub-total	-	-	630	450	12,801	5,197	39,861	12,248	40,703	14,576	31,956	10,500	3,557	1,124	3,715	1,038
4. Land Acquisition	-	-	-	-	-	1,970	-	1,920	-	2,240	-	2,620	-	-	-	-
5. Engineering and Administ.	4,840	1,740	2,440	1,160	740	750	2,640	1,470	2,100	980	1,580	650	860	1,000	500	300
6. Physical Contingency	484	174	307	161	1,354	792	4,250	1,564	4,280	1,780	3,354	1,377	442	212	422	134
7. Price Contingency	266	115	348	220	2,352	1,663	10,979	4,507	12,995	6,617	13,022	6,347	1,896	1,177	2,212	874
Grand Total	5,590	2,029	3,725	1,991	17,248	10,372	56,850	21,709	60,078	26,193	49,912	21,494	6,755	3,513	6,849	2,346

Items	9th (1993)		10th (1994)		Total	
	F.C	L.C	F.C	L.C	F.C	L.C
1. Dam Works	-	-	-	-	65,303	24,689
2. Power Station	-	-	-	-	-	-
3. Irrigation Systems	12,227	3,399	8,733	2,471	88,880	26,314
Sub-total	12,227	3,399	8,733	2,471	154,183	51,003
4. Land Acquisition	-	-	-	-	8,750	8,750
5. Engineering and Administ.	440	260	310	190	16,450	8,500
6. Physical Contingency	1,267	366	904	266	17,064	6,826
7. Price Contingency	7,678	2,773	6,257	2,315	57,126	26,608
Grand Total	21,612	6,798	16,204	5,242	244,823	101,687

Power Generating Works

Items	1st (1985)		2nd (1986)		3rd (1987)		4th (1988)		5th (1989)		6th (1990)		7th (1991)		Total	
	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C
1. Dam Works	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Power Station	-	-	-	-	2,080	320	800	590	7,508	1,430	2,360	430	-	-	12,748	2,770
3. Irrigation Systems	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	-	-	-	-	2,080	320	800	590	7,508	1,430	2,360	430	-	-	12,748	2,770
4. Land Acquisition	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Engineering and Administ.	-	-	-	-	120	50	60	70	400	100	120	30	-	-	700	250
6. Physical Contingency	-	-	-	-	220	37	86	66	791	153	248	46	-	-	1,345	302
7. Price Contingency	-	-	-	-	382	78	204	190	2,401	569	963	212	-	-	3,950	1,049
Grand Total	-	-	-	-	2,802	485	1,150	916	11,100	2,252	3,691	718	-	-	18,743	4,371

(Unit: Lp.103)

Table 9-6 DISBURSEMENT SCHEDULE (FINANCIAL)

Items	1st (1985)		2nd (1986)		3rd (1987)		4th (1988)		5th (1989)		6th (1990)		7th (1991)		Total	
	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C
	(Unit: Ip.103)															
Dam and Irrigation 16,000 ha																
1. Dam Works	-	-	630	450	6,199	2,873	11,557	3,786	25,888	10,363	21,029	7,217	-	-	65,303	24,689
2. Power Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Irrigation Systems	-	-	-	-	6,602	2,324	28,304	8,462	14,815	4,213	10,927	3,283	3,336	1,034	63,984	19,316
Sub-total	-	-	630	450	12,801	5,197	39,861	12,248	40,703	14,576	31,956	10,500	3,336	1,034	129,287	44,005
4. Land Acquisition	-	-	-	-	-	1,970	-	1,920	-	800	-	-	-	-	-	4,690
5. Engineering and Administ.	4,840	1,740	2,440	1,160	740	750	2,640	1,470	2,100	980	1,580	650	560	600	14,900	7,350
6. Physical Contingency	484	174	307	161	1,354	792	4,250	1,564	4,280	1,636	3,354	1,115	390	163	14,419	5,605
7. Price Contingency	266	115	348	220	2,354	1,663	10,099	4,507	12,995	6,081	13,022	5,139	1,744	906	40,828	18,631
Grand Total	5,590	2,029	3,725	1,991	17,249	10,372	56,850	21,709	60,078	24,073	49,912	17,404	6,030	2,703	199,434	80,281
Power Generating Works																
1. Dam Works	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Power Station	-	-	-	-	2,080	320	800	590	7,508	1,430	2,360	430	-	-	12,748	2,770
3. Irrigation Systems	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	-	-	-	-	2,080	320	800	590	7,508	1,430	2,360	430	-	-	12,748	2,770
4. Land Acquisition	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Engineering and Administ.	-	-	-	-	120	50	60	70	400	100	120	30	-	-	700	250
6. Physical Contingency	-	-	-	-	220	37	86	66	791	153	248	46	-	-	1,345	302
7. Price Contingency	-	-	-	-	382	78	204	190	2,401	569	963	212	-	-	3,950	1,049
Grand Total	-	-	-	-	2,802	485	1,150	916	11,100	2,252	3,691	718	-	-	18,743	4,371
Grand Total	-	-	-	-	2,802	485	1,150	916	11,100	2,252	3,691	718	-	-	18,743	4,371
Grand Total	-	-	-	-	2,802	485	1,150	916	11,100	2,252	3,691	718	-	-	18,743	4,371

Table 9-7 DISBURSEMENT SCHEDULE (FINANCIAL)

Dam, Power and Irrigation 12,400 ha

Items	1st (1985)		2nd (1986)		3rd (1987)		4th (1988)		5th (1989)		6th (1990)		7th (1991)		Total		
	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	
1. Dam Works	-	-	630	450	6,199	2,873	11,557	3,786	25,888	10,363	21,029	7,217	-	-	65,303	24,689	89,992
2. Power Station	-	-	-	-	2,080	320	800	590	7,508	1,430	2,360	430	-	-	12,748	2,770	15,518
3. Irrigation Systems	-	-	-	-	6,526	2,272	27,912	8,192	14,619	4,078	2,338	660	-	-	51,395	15,202	66,597
Sub-total	-	-	630	450	14,805	5,465	40,269	12,568	48,015	15,871	25,727	8,307	-	-	129,446	42,661	172,107
4. Land Acquisition	-	-	-	-	-	1,700	-	1,650	-	650	-	-	-	-	-	4,000	4,000
5. Engineering and Administ.	4,840	1,740	2,440	1,160	860	800	2,400	1,340	2,200	930	1,400	580	-	-	14,140	6,550	20,690
6. Physical Contingency	484	174	307	161	1,567	797	4,267	1,556	5,022	1,745	2,713	889	-	-	14,360	5,322	19,682
7. Price Contingency	266	115	348	220	2,723	1,674	10,138	4,484	15,245	6,488	10,534	4,095	-	-	39,254	17,076	56,330
Grand Total	5,590	2,029	3,725	1,991	19,955	10,436	57,074	21,598	70,482	25,684	40,374	13,871	-	-	197,200	75,609	272,809

Table 10-1 DISBURSEMENT SCHEDULE (ECONOMIC)  
IRRIGATION SYSTEM (23,960 HA)

Items	1st (1985)		2nd (1986)		3rd (1987)		4th (1988)		5th (1989)		6th (1990)		7th (1991)		8th (1992)	
	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C
Dam, Power and Irrigation 20,600 ha																
1. Dam Works	-	-	788	428	7,749	2,729	14,446	3,597	32,360	9,845	26,286	6,855	-	-	-	-
2. Power Station	-	-	-	-	2,600	304	1,000	560	9,385	1,359	2,950	409	-	-	-	-
3. Irrigation Systems	-	-	-	-	8,253	2,208	35,380	8,039	18,518	4,005	13,655	3,121	4,440	1,067	4,644	986
Sub-total	-	-	788	428	18,602	5,241	50,826	12,196	60,263	15,209	42,891	10,385	4,440	1,067	4,644	986
4. Land Acquisition	-	-	-	-	-	370	-	370	-	670	-	740	-	-	-	-
5. Engineering and Administ.	6,050	1,740	3,050	1,160	1,075	800	3,375	1,540	3,125	1,080	2,125	680	1,325	900	625	300
6. Physical Contingency	605	174	384	159	1,968	641	5,420	1,411	6,339	1,696	4,502	1,181	577	197	527	129
Grand Total	6,655	1,914	4,222	1,747	21,645	7,052	59,621	15,517	69,727	18,655	49,518	12,986	6,342	2,164	5,796	1,415

(Unit: Ip.103)

Items	9th (1993)		10th (1994)		Total	
	F.C	L.C	F.C	L.C	F.C	L.C
1. Dam Works	-	-	-	-	81,629	23,454
2. Power Station	-	-	-	-	15,935	2,632
3. Irrigation Systems	15,284	3,229	10,916	2,347	111,090	25,002
Sub-total	15,284	3,229	10,916	2,347	208,654	51,088
4. Land Acquisition	-	-	-	-	2,150	2,150
5. Engineering and Administ.	550	260	390	190	21,690	8,650
6. Physical Contingency	1,583	349	1,131	254	23,036	6,191
Grand Total	17,417	3,838	12,437	2,791	263,380	68,079

Middle Reach 3,360 ha

Items	1st (1985)		2nd (1986)		3rd (1987)		4th (1988)		5th (1989)		6th (1990)		7th (1991)		Total	
	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C
1. Dam Works	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Power Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Irrigation Systems	-	-	-	-	-	-	1,325	292	2,400	358	2,400	358	-	-	6,125	1,008
Sub-total	-	-	-	-	-	-	1,325	292	2,400	358	2,400	358	-	-	6,125	1,008
4. Land Acquisition	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Engineering and Administ.	-	-	-	-	-	-	133	29	240	36	240	36	-	-	613	101
6. Physical Contingency	-	-	-	-	-	-	146	32	264	39	264	39	-	-	674	110
Grand Total	-	-	-	-	-	-	1,604	353	2,094	433	2,904	433	-	-	7,412	1,219

(Unit: Ip.103)

Table 10-2 DISBURSEMENT SCHEDULE (ECONOMIC)  
IRRIGATION SYSTEM (19,360 HA)

Items	1st (1985)		2nd (1986)		3rd (1987)		4th (1988)		5th (1989)		6th (1990)		7th (1991)		Total		
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	
	(Unit: Ip.103)																
Dam, Power and Irrigation 16,000 ha	-	-	788	428	7,749	2,729	14,446	3,597	32,360	9,845	26,286	6,855	-	-	81,629	23,454	105,083
1. Dam Works	-	-	-	-	2,600	304	1,000	560	9,385	1,359	2,950	409	-	-	15,935	2,632	18,567
2. Power Station	-	-	-	-	8,253	2,208	35,380	8,039	18,518	4,005	13,655	3,121	4,171	963	79,977	18,336	98,313
3. Irrigation Systems	-	-	788	428	18,602	5,241	50,826	12,196	60,263	15,209	42,891	10,385	4,171	963	177,541	44,422	221,963
Sub-total	-	-	-	-	-	370	-	370	-	180	-	-	-	-	-	920	920
4. Land Acquisition	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Engineering and Administ.	6,050	1,740	3,050	1,160	1,075	800	3,375	1,540	3,125	1,080	2,125	680	700	600	19,500	7,600	27,100
6. Physical Contingency	605	174	384	159	1,968	641	5,420	1,411	6,339	1,647	4,502	1,107	487	156	19,705	5,295	25,000
Grand Total	6,655	1,917	4,222	1,747	21,645	7,052	59,621	15,517	69,727	18,116	49,518	12,172	5,358	1,719	216,746	58,237	274,983

Items	1st (1985)		2nd (1986)		3rd (1987)		4th (1988)		5th (1989)		6th (1990)		7th (1991)		Total		
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	
	(Unit: Ip.103)																
Middle Reach 3,360 ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1. Dam Works	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Power Station	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Irrigation Systems	-	-	-	-	-	-	1,325	292	2,400	358	2,400	358	-	-	6,125	1,008	7,133
Sub-total	-	-	-	-	-	-	1,325	292	2,400	358	2,400	358	-	-	6,125	1,008	7,133
4. Land Acquisition	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Engineering and Administ.	-	-	-	-	-	-	133	29	240	36	240	36	-	-	613	101	714
6. Physical Contingency	-	-	-	-	-	-	146	32	264	39	264	39	-	-	674	110	784
Grand Total	-	-	-	-	-	-	1,604	353	2,904	433	2,904	433	-	-	7,412	1,219	8,631

Table 10-3 DISBURSEMENT SCHEDULE (ECONOMIC)

Items	(Unit: Ip.103)																
	1st (1985)		2nd (1986)		3rd (1987)		4th (1988)		5th (1989)		6th (1990)		7th (1991)		Total		
	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	
Dam, Power and Irrigation 16,000 ha	-	-	788	428	7,749	2,729	14,446	3,597	32,360	9,845	26,286	6,855	-	-	81,629	23,454	105,083
1. Dam Works	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Power Station	-	-	-	-	2,600	304	1,000	560	9,385	1,359	2,950	409	-	-	15,935	2,632	18,567
3. Irrigation Systems	-	-	-	-	8,253	2,208	35,380	8,039	18,518	4,005	13,655	3,121	4,171	963	79,977	18,336	98,313
Sub-total	-	-	788	428	18,602	5,241	50,826	12,196	60,263	15,209	42,891	10,385	4,171	963	177,541	44,422	221,963
4. Land Acquisition	-	-	-	-	-	370	-	370	-	180	-	-	-	-	-	-	920
5. Engineering and Administ.	6,050	1,740	3,050	1,160	1,075	800	3,375	1,540	3,125	1,080	2,125	680	700	600	19,500	7,600	27,100
6. Physical Contingency	605	174	384	159	1,968	641	5,420	1,411	6,339	1,647	4,502	1,107	487	156	19,705	5,295	25,000
Grand Total	6,655	1,914	4,222	1,747	21,645	7,052	59,621	15,517	69,727	18,116	49,518	12,172	5,358	1,719	216,746	58,237	274,983

Items	(Unit: Ip.103)																
	1st (1985)		2nd (1986)		3rd (1987)		4th (1988)		5th (1989)		6th (1990)		7th (1991)		Total		
	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	
Dam, Power and Irrigation 12,400 ha	-	-	788	428	7,749	2,729	14,446	3,597	32,360	9,845	26,286	6,855	-	-	81,629	23,454	105,083
1. Dam Works	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Power Station	-	-	-	-	2,600	304	1,000	560	9,385	1,359	2,950	409	-	-	15,935	2,632	18,567
3. Irrigation Systems	-	-	-	-	8,156	2,159	34,890	7,781	18,275	3,875	2,293	626	-	-	64,244	14,441	78,685
Sub-total	-	-	788	428	18,505	5,192	50,336	11,938	60,020	15,079	32,159	7,890	-	-	161,808	40,527	202,335
4. Land Acquisition	-	-	-	-	-	300	-	300	-	150	-	-	-	-	-	-	750
5. Engineering and Administ.	6,050	1,740	3,050	1,160	1,075	800	3,075	1,340	2,825	930	1,825	580	-	-	17,900	6,550	24,450
6. Physical Contingency	605	174	384	159	1,958	629	5,341	1,358	6,285	1,616	3,398	847	-	-	17,971	4,783	22,754
Grand Total	6,655	1,914	4,222	1,747	21,538	6,921	58,752	14,936	69,130	17,775	37,382	9,317	-	-	197,679	52,610	250,289

Table 10-4 AGRICULTURAL BENEFIT (WESTERN PLAIN)

Crop	Without Project			With Project			Incremental (10 <sup>3</sup> lp.)
	Area (ha)	Net Return (lp./ha)	Total Return (10 <sup>3</sup> lp.)	Area (ha)	Net Return (lp./ha)	Total Return (10 <sup>3</sup> lp.)	
Sugar cane							
Estate	3,180	2,378	7,562	3,180	4,382	13,935	
Outgrowers	6,070	2,889	17,536	3,670	4,382	16,082	
Cotton	740	2,128	1,575	4,830	3,432	16,577	
Paddy	80	1,242	99	4,050	1,545	6,257	
Maize	1,050	370	389	2,000	1,026	2,052	
Sorghum	120	317	38	-	-	-	
Beans	-	-	-	2,830	1,783	5,046	
Sesame	150	545	82	250	1,288	322	
Melon	1,200	1,450	1,740	2,000	3,684	7,368	
Water melon	70	1,027	72	200	1,267	253	
Vegetables	-	-	-	1,600	1,563	2,501	
Pasture/Forest	6,830	213	1,455	140	322	45	
Total			30,548			70,438	39,890



Table 10-5 AGRICULTURAL BENEFIT (EASTERN PLAIN - A)

Crop	Without Project			With Project			Incremental (103Ip.)
	Area (ha)	Net Return (Ip./ha)	Total Return (103Ip.)	Area (ha)	Net Return (Ip./ha)	Total Return (103Ip.)	
Sugar cane							
Estate	-	-	-	-	-	-	-
Outgrowers	190	2,889	549	-	-	-	-
Cotton	-	-	-	2,300	3,432	7,894	7,894
Maize	20	370	7	2,300	1,026	2,360	2,360
Paddy	1,400	1,242	1,739	2,300	1,545	3,554	3,554
Beans	-	-	-	2,300	1,783	4,101	4,101
Pasture/Forest	4,530	213	965	-	-	-	-
Total			<u>3,260</u>			<u>17,909</u>	<u>14,649</u>

Table 10-6 ESTIMATED ECONOMIC RETURN FROM AGRICULTURAL PRODUCTION IN MIDDLE REACH

	Present			Proposed			Incremental (10 <sup>3</sup> Lp.)
	Area (ha)	Net Return (Lp./ha)	Total Return (10 <sup>3</sup> Lp.)	Area (ha)	Net Return (Lp./ha)	Total Return (10 <sup>3</sup> Lp.)	
1) San Juan de Flores:							
Sugar cane							
Irrigated	1,630	1,811	2,952	2,680	3,498	9,375	
Non-irrigated	1,020	1,811	1,847	-	-	-	
Maize	30	148	4	-	-	-	
Sub-total			<u>4,803</u>			<u>9,375</u>	<u>4,572</u>
2) Orocuina:							
(Irrigated)							
Paddy							
Wet season	-	-	-	160	1,545	247	
Dry season	-	-	-	160	1,545	247	
Maize	-	-	-	150	1,026	154	
Beans	-	-	-	150	1,783	267	
Vegetables	-	-	-	20	1,563	31	
Sorghum	15	317	5	-	-	-	
Sesame	10	545	5	-	-	-	
Melon	10	1,450	15	-	-	-	
(Non-irrigated)							
Maize	120	148	18	-	-	-	
Livestock	175	213	37	-	-	-	
Sub-total			<u>80</u>			<u>946</u>	<u>866</u>
3) Orocuina - Choluteca							
Paddy							
Wet season	350	1,242	435	350	1,545	541	
Dry season	350	1,242	435	350	1,545	541	
Sub-total			<u>870</u>			<u>1,082</u>	<u>212</u>
Total			<u>5,753</u>			<u>11,403</u>	<u>5,650</u>

Table 10-7 ECONOMIC COST AND BENEFIT FLOW (20,600 HA)

(Unit: Ip.106)

Year in Order	Year	Economic Cost				Economic Benefit						
		Investment & Replacement Cost		O & M Cost		Irrigation Benefit		Power Benefit		Middle Reach Area		
		Dam & Power Station and Irrigation System	Middle Reach Area	Dam & Power Station	Irrigation System	Middle Reach Area	Total	Irrigation Benefit	Power Benefit	Middle Reach Area	Negative Benefit	Total
1	1985	8.57	-	-	-	-	8.57	-	-	-	-	-
2	1986	5.97	-	-	-	-	5.97	-	-	-	-	-
3	1987	28.70	-	-	-	-	28.70	-	1.43	-	-	1.43
4	1988	75.14	1.96	-	-	-	77.10	-	8.60	-	-0.04	8.56
5	1989	88.38	3.34	-	-	-	91.72	-	12.90	-	-0.04	12.86
6	1990	62.50	3.34	-	-	-	66.24	0.88	5.73	-	-0.38	6.23
7	1991	8.51	-	0.20	0.40	0.14	10.37	12.36	8.14	2.26	-0.38	22.38
8	1992	7.21	-	0.20	1.97	0.14	9.52	20.59	8.14	3.11	-0.38	31.46
9	1993	21.26	-	0.20	1.97	0.14	23.57	26.58	8.14	3.96	-0.38	38.30
10	1994	15.23	-	0.20	1.97	0.14	17.54	32.56	8.14	4.81	-0.38	45.13
11	1995	-	-	0.20	2.72	0.14	3.06	44.40	8.14	5.65	-0.38	57.81
12	1996	-	-	0.20	2.72	0.14	3.06	47.95	8.14	5.65	-0.38	61.36
13	1997	-	-	0.20	2.72	0.14	3.06	50.15	8.14	5.65	-0.38	63.56
14	1998	-	-	0.20	2.72	0.14	3.06	52.34	8.14	5.65	-0.38	65.75
15	1999	-	-	0.20	2.72	0.14	3.06	54.54	8.14	5.65	-0.38	67.95
∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴
27	2011	-	-	0.20	2.72	0.14	3.06	54.54	8.14	5.65	-0.38	67.95
28	2012	-	-	0.20	2.72	0.14	3.06	54.54	1.29	5.65	-0.38	61.10
29	2013	10.29	2.07	0.20	2.72	0.14	15.42	54.54	7.74	5.65	-0.38	67.55
30	2014	-	-	0.20	2.72	0.14	3.06	54.54	11.61	5.65	-0.38	71.42
31	2015	-	-	0.20	2.72	0.14	3.06	54.54	5.16	5.65	-0.38	64.97
32	2016	-	-	0.20	2.72	0.14	3.06	54.54	8.14	5.65	-0.38	67.95
33	2017	-	-	0.20	2.72	0.14	3.06	54.54	8.14	5.65	-0.38	67.95
34	2018	1.19	-	0.20	2.72	0.14	4.25	54.54	8.14	5.65	-0.38	67.95
35	2019	-	-	0.20	2.72	0.14	3.06	54.54	8.14	5.65	-0.38	67.95
∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴
50	2034	-	-	0.20	2.72	0.14	3.06	54.54	8.14	5.65	-0.38	67.95

EIRR: 14.28



Table 10-9 ECONOMIC COST AND BENEFIT FLOW (12,400 HA)

(Unit: Ip.106)

Year in Order	Year	Investment & Replacement Cost				Economic Cost				Economic Benefit			
		Dam & Power Station and Irrigation System	Middle Reach Area	Dam & Power Station	Irrigation System	Middle Reach Area	Total	Irrigation Benefit	Power Benefit	Middle Reach Area	Negative Benefit	Total	
1	1985	8.57	-	-	-	-	8.57	-	-	-	-	-	-
2	1986	5.97	-	-	-	-	5.97	-	-	-	-	-	-
3	1987	28.46	-	-	-	-	28.46	-	1.43	-	-	1.43	-
4	1988	73.69	1.96	-	-	-	75.65	-	8.60	-	-0.04	8.56	-
5	1989	86.91	3.34	-	-	-	90.25	-	12.90	-	-0.04	12.86	-
6	1990	46.70	3.34	-	-	-	50.04	0.88	5.73	-	-0.38	6.23	-
7	1991	-	-	0.20	1.57	0.14	1.91	12.36	8.14	2.26	-0.38	22.38	-
8	1992	-	-	0.20	1.57	0.14	1.91	17.00	8.14	3.11	-0.38	27.87	-
9	1993	-	-	0.20	1.57	0.14	1.91	21.64	8.14	3.96	-0.38	33.36	-
10	1994	-	-	0.20	1.57	0.14	1.91	26.28	8.14	4.81	-0.38	38.85	-
11	1995	-	-	0.20	1.57	0.14	1.91	30.91	8.14	5.65	-0.38	44.32	-
12	1996	-	-	0.20	1.57	0.14	1.91	30.91	8.14	5.65	-0.38	44.32	-
.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.
27	2011	-	-	0.20	1.57	0.14	1.91	30.91	8.14	5.65	-0.38	44.32	-
28	2012	-	-	0.20	1.57	0.14	1.91	30.91	1.29	5.65	-0.38	37.47	-
29	2013	10.23	2.07	0.20	1.57	0.14	3.98	30.91	7.74	5.65	-0.38	43.92	-
30	2014	-	-	0.20	1.57	0.14	1.91	30.91	11.61	5.65	-0.38	47.79	-
31	2015	-	-	0.20	1.57	0.14	1.91	30.91	5.16	5.65	-0.38	41.34	-
32	2016	-	-	0.20	1.57	0.14	1.91	30.91	8.14	5.65	-0.38	44.32	-
.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.
50	2034	-	-	0.20	1.57	0.14	1.91	30.91	8.14	5.65	-0.38	44.32	-

EIRR: 12.9%

Table 10-10 SENSITIVITY ANALYSIS

Cost Increase	Benefit Decrease			
	0%	5%	10%	15%
(Unit: %)				
Dam, Power and Irrigation (20,600 ha)				
0%	14.2	13.7	13.1	12.4
5%	13.7	13.1	12.5	11.9
10%	13.2	12.6	12.0	11.4
15%	12.7	12.1	11.6	11.0
Dam, Power and Irrigation (16,000 ha)				
0%	13.7	13.1	12.5	11.8
5%	13.1	12.6	12.0	11.4
10%	12.6	12.1	11.5	10.9
15%	12.1	11.6	11.1	10.5
Dam, Power and Irrigation (12,400 ha)				
0%	12.9	12.3	11.7	11.1
5%	12.4	11.9	11.3	10.7
10%	11.9	11.4	10.8	10.2
15%	11.4	10.9	10.4	9.8

Table 11-1 FINANCIAL COST AND BENEFIT FLOW  
(IRRIGATION PLAN: 20,600 HA)

(Unit: Lp.106)

Year in Order	Year	Financial Cost			Financial Benefit		
		Investment and Replace. Cost	O & M Cost	Total	Net Return	Domestic Consumption	Total
1	1985	7.62	-	7.62	-	-	-
2	1986	5.72	-	5.72	-	-	-
3	1987	27.62	-	27.62	-	-	-
4	1988	78.56	-	78.56	-	-	-
5	1989	86.27	-	86.27	-	-	-
6	1990	71.41	0.46	71.87	1.07	-	1.07
7	1991	10.27	1.82	12.09	15.79	-4.92	10.87
8	1992	9.20	2.59	11.79	27.61	-5.17	22.44
9	1993	28.41	2.71	31.12	37.43	-5.43	32.00
10	1994	21.45	2.85	24.30	48.15	-5.70	42.45
11	1995	-	3.89	3.89	65.66	-5.70	59.96
12	1996	-	3.89	3.89	70.92	-5.70	65.22
13	1997	-	3.89	3.89	74.16	-5.70	68.46
14	1998	-	3.89	3.89	77.40	-5.70	71.70
15	1999	-	3.89	3.89	80.66	-5.70	74.96
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
28	2012	-	3.89	3.89	80.66	-5.70	74.96
29	2013	3.52	3.89	7.41	80.66	-5.70	74.96
30	2014	-	3.89	3.89	80.66	-5.70	74.96
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
33	2017	-	3.89	3.89	80.66	-5.70	74.96
34	2018	1.94	3.89	5.83	80.66	-5.70	74.96
35	2019	-	3.89	3.89	80.66	-5.70	74.96
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
50	2034	-	3.89	3.89	80.66	-5.70	74.96

FIRR: 13.1%

Table 11-2 FINANCIAL COST AND BENEFIT FLOW  
(IRRIGATION PLAN: 16,000 HA)

(Unit: Lp.106)

Year in Order	Year	Financial Cost			Financial Benefit		
		Investment and Replace. Cost	O & M Cost	Total	Net Return	Domestic Consumption	Total
1	1985	7.62	-	7.62	-		-
2	1986	5.72	-	5.72	-		-
3	1987	27.62	-	27.62	-		-
4	1988	78.56	-	78.56	-		-
5	1989	84.15	-	84.15	-		-
6	1990	67.32	0.46	67.78	1.13		1.13
7	1991	8.73	1.82	10.55	16.65	-3.80	12.85
8	1992	-	2.48	2.48	27.73	-3.80	23.93
9	1993	-	2.48	2.48	35.81	-3.80	32.01
10	1994	-	2.48	2.48	43.86	-3.80	40.06
11	1995	-	2.48	2.48	51.92	-3.80	48.12
12	1996	-	2.48	2.48	53.74	-3.80	49.94
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
28	2012	-	2.48	2.48	53.74	-3.80	49.94
29	2013	3.04	2.48	2.48	53.74	-3.80	49.94
30	2014	-	2.48	2.48	53.74	-3.80	49.94
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
50	2034	-	2.48	2.48	53.74	-3.80	49.94

FIRR: 11.7%



Table 11-3 FINANCIAL COST AND BENEFIT FLOW  
(POWER GENERATION PLAN)

(Unit: Ip.10<sup>6</sup>)

Year in Order	Year	Financial Cost			Financial Benefit Power Revenue
		Capital Investment and Replacement Cost	O & M Cost	Total	
1	1985	-	-	-	-
2	1986	-	-	-	-
3	1987	3.29	-	3.29	-
4	1988	2.07	-	2.07	-
5	1989	13.35	-	13.35	-
6	1990	4.41	-	4.41	-
7	1991	-	0.63	0.63	12.24
8	1992	-	0.63	0.63	12.24
9	1993	-	0.63	0.63	12.24
10	1994	-	0.63	0.63	12.24
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
28	2012	-	0.63	0.63	12.24
29	2013	18.91	0.63	19.54	12.24
30	2014	-	0.63	0.63	12.24
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
50	2034	-	0.63	0.63	12.24

FIRR: 34.0%

Table 11-4 FINANCIAL COST AND BENEFIT FLOW  
(IRRIGATION FOR 16,000 HA AND POWER GENERATION)

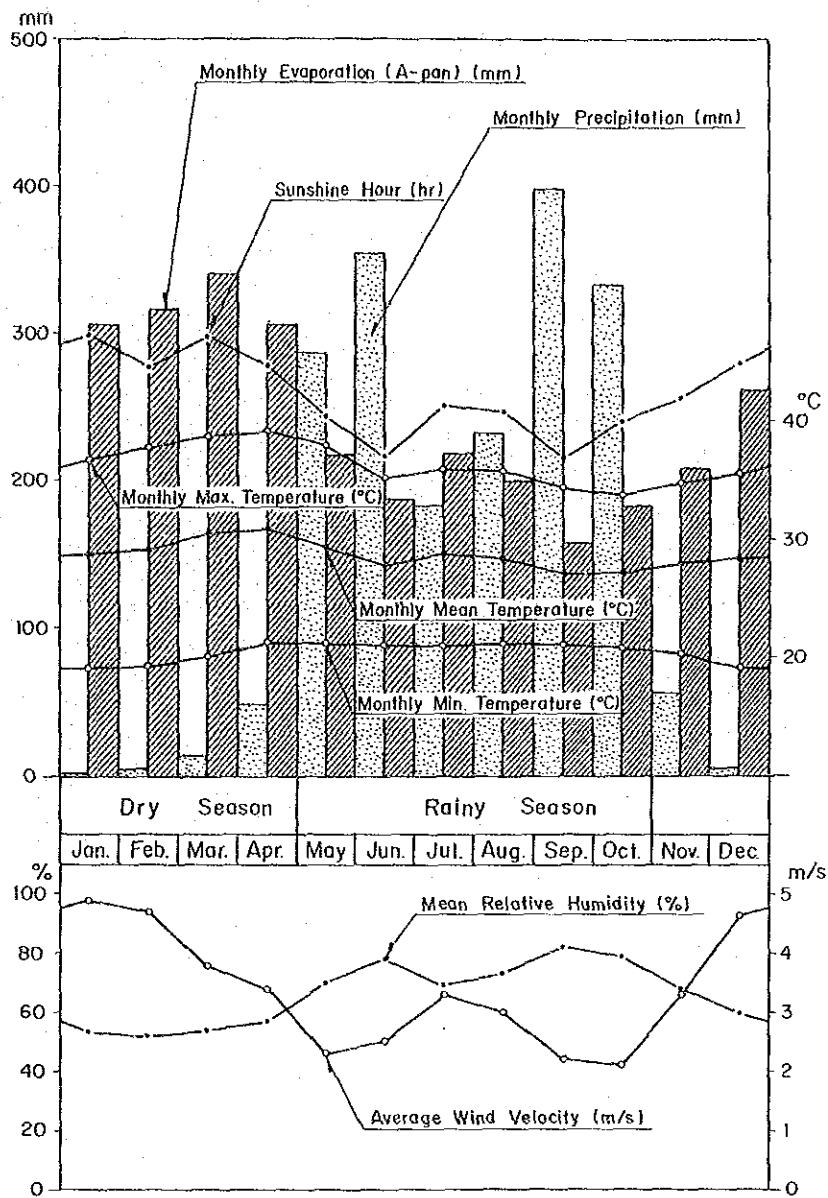
Year in Order	Year	Financial Cost			Financial Benefit		
		Investment and Replace. Dam & Irri. Power Generat.	O & M Cost Dam & Irri. Power Generat.	Total	Marketable Production Revenue	Power Revenue	Total
1	1985	-	-	7.62	-	-	-
2	1986	-	-	5.72	-	-	-
3	1987	3.29	-	30.91	-	-	-
4	1988	2.07	-	80.63	-	-	-
5	1989	13.35	-	97.50	-	-	-
6	1990	4.41	0.46	72.19	1.13	-	1.13
7	1991	8.73	1.82	11.18	12.85	12.24	25.09
8	1992	-	2.48	3.11	23.93	12.24	36.17
9	1993	-	2.48	3.11	32.01	12.24	44.25
10	1994	-	2.48	3.11	40.06	12.24	52.30
11	1995	-	2.48	3.11	48.12	12.24	60.36
12	1996	-	2.48	3.11	49.94	12.24	62.18
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
28	2012	-	2.48	3.11	49.94	12.24	62.18
29	2013	18.91	2.48	25.06	49.94	12.24	62.18
30	2014	-	2.48	3.11	49.94	12.24	62.18
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
50	2034	-	2.48	3.11	49.94	12.24	62.18

FIRR: 13.5%



## **FIGURES**

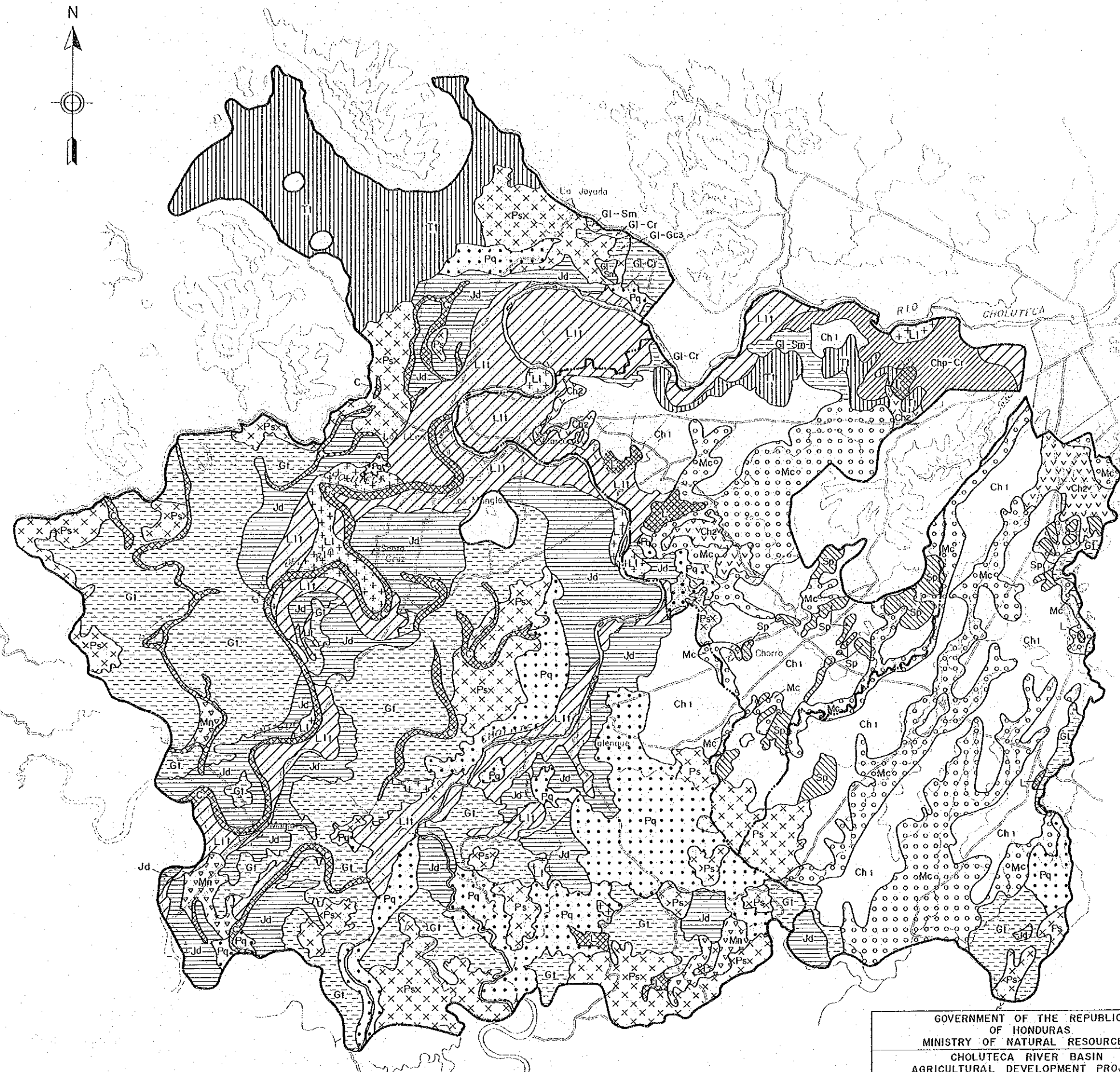
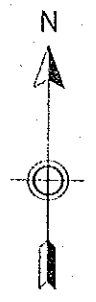




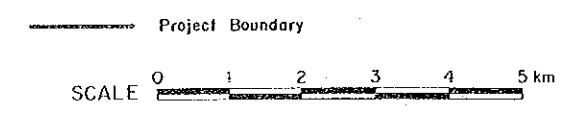
GOVERNMENT OF THE REPUBLIC  
OF HONDURAS  
MINISTRY OF NATURAL RESOURCES  
CHOLUTECA RIVER BASIN  
AGRICULTURAL DEVELOPMENT PROJECT  
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig.  
2-1

CHARACTERISTICS OF CLIMATE  
AT CHOLUTECA

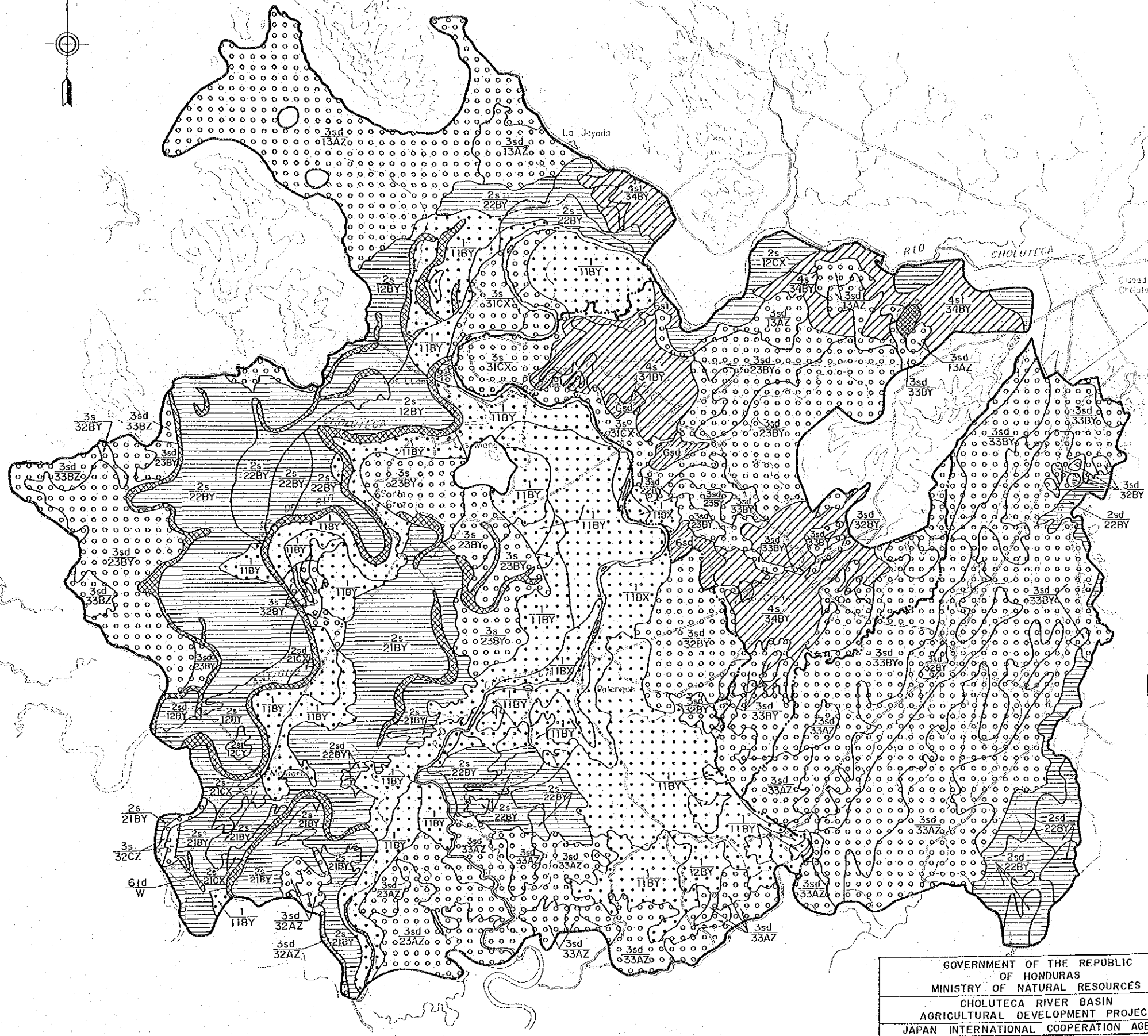
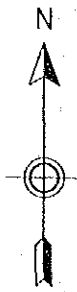


Mapping Symbol	Soil Classification	Western Plain	Eastern Plain	Total
		ha %	ha %	ha %
(L1)	Fluentic Ustropepts - Inceptisols	410 (1.8)	180 (1.3)	560 (1.6)
(L11)	Typic Ustilfluents - Entisols	2,770 (12.4)	690 (5.1)	3,460 (9.7)
(Jd)	Fluentic Haplustolls			
(G1)	Aquic Haplustolls			
(Mn)	Fluentic Haplustolls	15,960 (71.3)	180 (1.3)	16,140 (44.8)
(Pq)	Fluvaquentic Haplustolls			
(Ps)	Fluvaquentic Haploquolls			
(Ch1)	Aquic Haplustolls			
(Ch2)	Aquic Haplustolls	620 (2.8)	10,930 (80.4)	11,550 (32.1)
(Mc)	Vertic Tropequalls			
(Ti)	Typic Pellusterts - Vertisols	1,410 (6.3)	290 (2.1)	1,700 (4.7)
(Chp-Cr)	Udic Haplustolls			
(G1-Cr)	Udic Haplustolls	300 (1.3)	790 (5.8)	1,090 (3.0)
(G1-GC3)	Udic Haplustolls			
(G1-Sm)	Udic Haplustolls			
(Sp)	Udic Paleustolls - Ullisols	-	320 (2.4)	320 (0.7)
(C)	Pond, Water	930 (4.1)	220 (1.6)	1,150 (3.2)
(L)	Riverbed			
<b>Total</b>		<b>22,400 (100.0)</b>	<b>13,600 (100.0)</b>	<b>36,000 (100.0)</b>

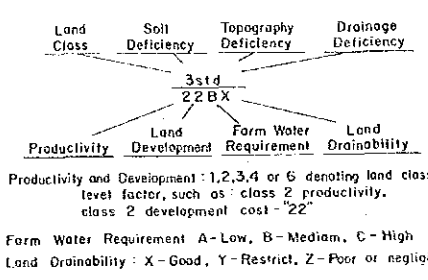


GOVERNMENT OF THE REPUBLIC OF HONDURAS  
 MINISTRY OF NATURAL RESOURCES  
 CHOLUTECA RIVER BASIN  
 AGRICULTURAL DEVELOPMENT PROJECT  
 JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 3-1 SOIL MAP OF CHOLUTECA PLAIN



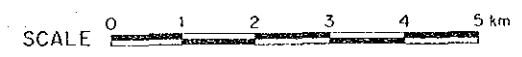
EXAMPLE OF STANDARD MAPPING SYMBOL



Mapping Symbol	Land Classification	Western Plain		Eastern Plain		Total	
		ha	%	ha	%	ha	%
[Symbol: Dotted]	Class I	6,740	30.0	110	0.8	6,850	19.0
[Symbol: Horizontal lines]	Class II	6,750	30.1	1,420	10.4	8,170	22.7
[Symbol: Vertical lines]	Class III	7,590	33.9	9,350	68.8	16,940	47.0
[Symbol: Diagonal lines /]	Class IV	130	0.6	2,200	16.2	2,330	6.5
[Symbol: Diagonal lines \]	Class V	260	1.2	300	2.2	560	1.6
[Symbol: Cross-hatched]	Water	930	4.2	220	1.6	1,150	3.2
	<b>Total</b>	<b>22,400</b>	<b>100.0</b>	<b>13,600</b>	<b>100.0</b>	<b>36,300</b>	<b>100.0</b>

LEGEND

Project Boundary



GOVERNMENT OF THE REPUBLIC OF HONDURAS MINISTRY OF NATURAL RESOURCES CHOLUTECA RIVER BASIN AGRICULTURAL DEVELOPMENT PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. <b>3-2</b>	<b>LAND CAPABILITY MAP OF          CHOLUTECA PLAIN</b>
---	--------------------	--





- WESTERN PLAIN -

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
	Plant Cane											
Sugar cane 6,980 ha	1st Ratoon											
	2nd Ratoon											
	3rd Ratoon											
	4th Ratoon											
Paddy - Melon 2,000 ha	Paddy											Melon
Paddy - Vegetables 800 ha	Paddy											Vegetables
Paddy - Beans 1,000 ha	Paddy											Beans
Paddy - Sesame 250 ha	Paddy											Sesame
Cotton - Maize 2,000 ha	Maize											Cotton
Cotton - Beans 1,830 ha	Beans											Cotton
Cotton - Vegetables 800 ha	Vegetables											Cotton
Cotton - Water melon 200 ha	Water melon											Cotton
Pasture 140 ha	Pasture											

- EASTERN PLAIN - A -

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Paddy - Maize 1,150 ha	Paddy											Maize
Paddy - Beans 1,150 ha	Paddy											Beans
Cotton - Maize 1,150 ha	Maize											Cotton
Cotton - Beans 1,150 ha	Beans											Cotton

- EASTERN PLAIN - B -

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Cotton - Maize 1,100 ha	Maize											Cotton
Cotton - Beans 1,100 ha	Beans											Cotton
Paddy - Maize 500 ha	Paddy											Maize
Paddy - Beans 500 ha	Paddy											Beans
Pasture 2,000 ha	Pasture											

GOVERNMENT OF THE REPUBLIC  
OF HONDURAS  
MINISTRY OF NATURAL RESOURCES

CHOLUTECA RIVER BASIN  
AGRICULTURAL DEVELOPMENT PROJECT

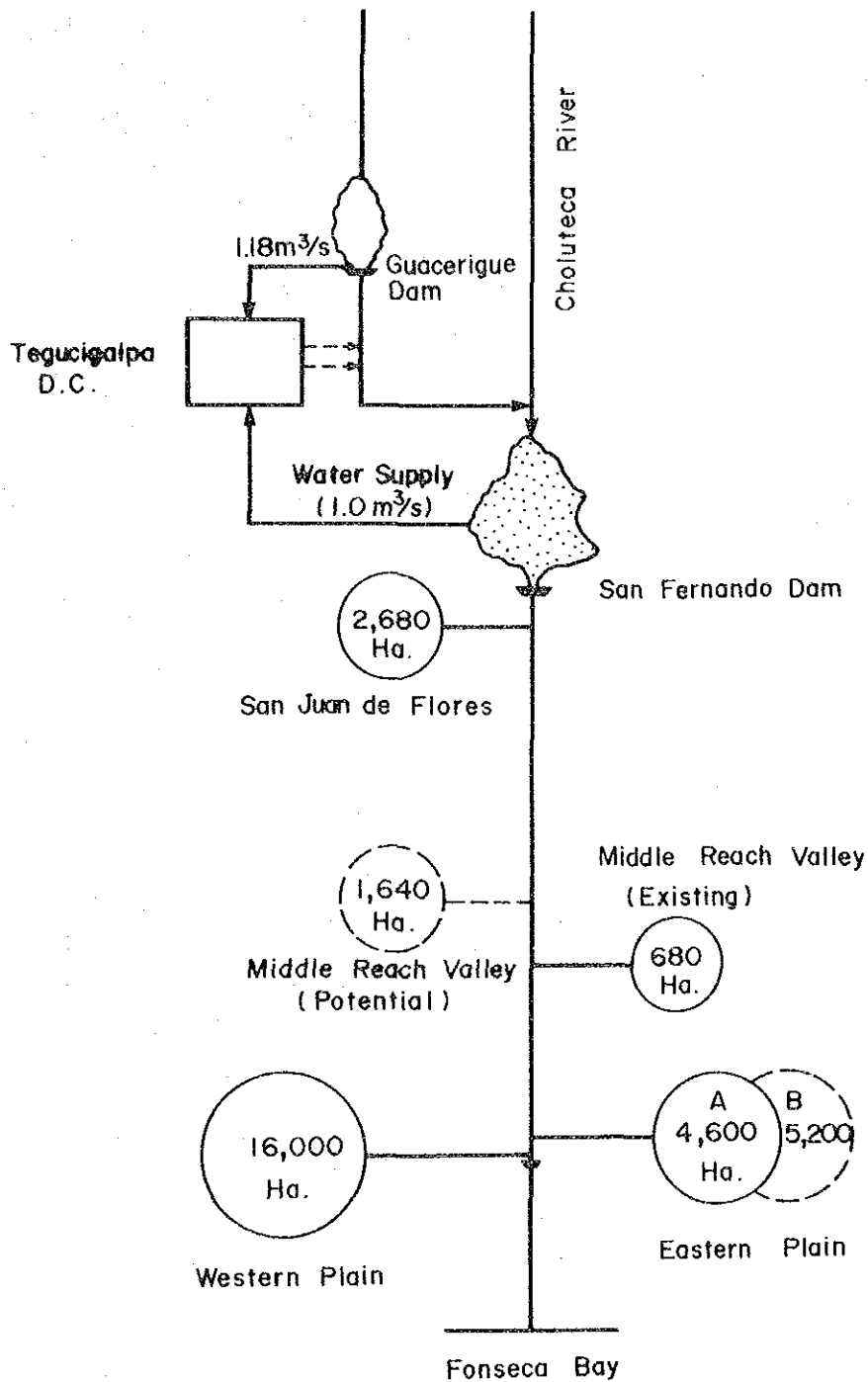
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig.

4-1

PROPOSED CROPPING PATTERN  
FOR CHOLUTECA PLAIN





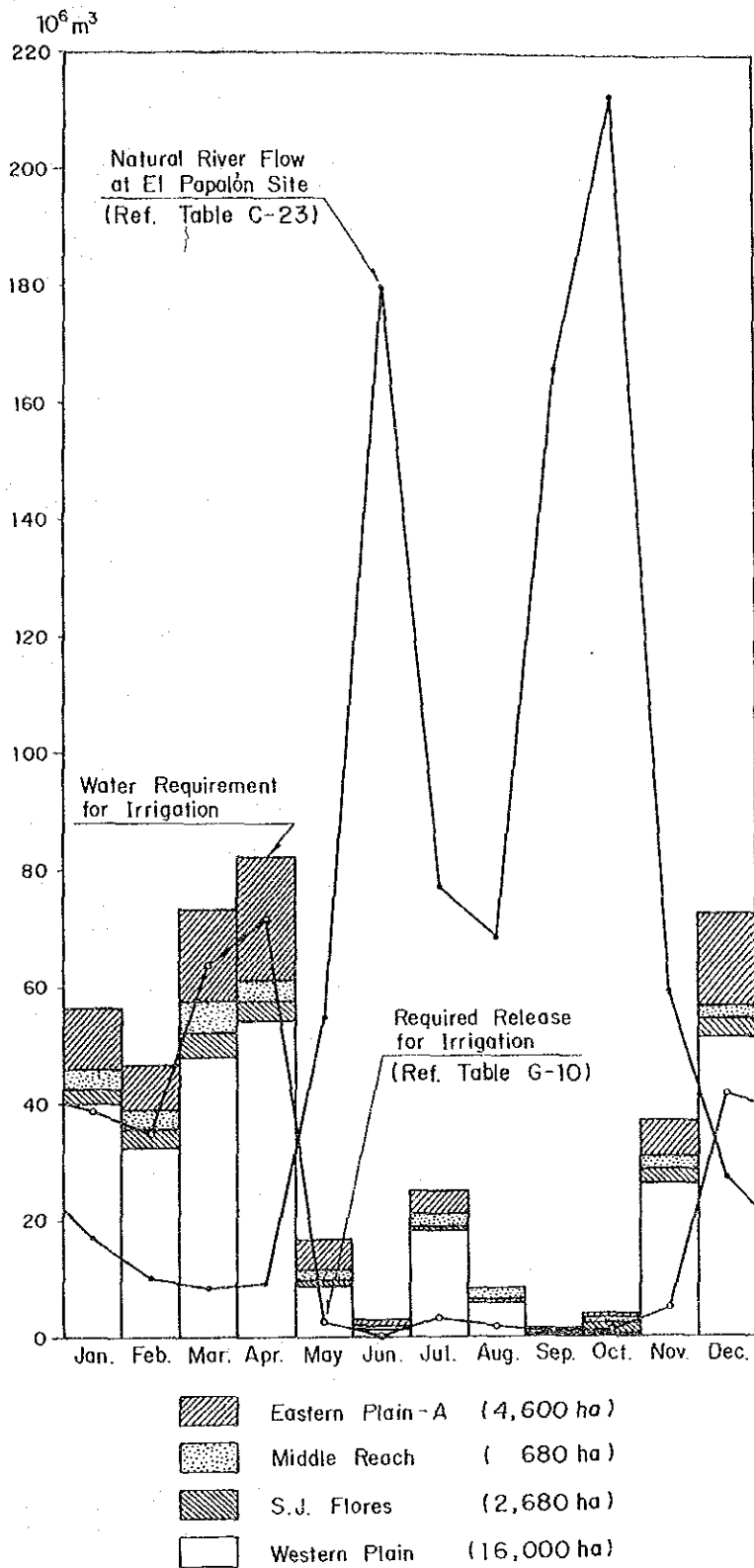
GOVERNMENT OF THE REPUBLIC  
OF HONDURAS  
MINISTRY OF NATURAL RESOURCES  
CHOLUTECA RIVER BASIN  
AGRICULTURAL DEVELOPMENT PROJECT  
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig.

5-1

MODEL OF CHOLUTECA RIVER BASIN

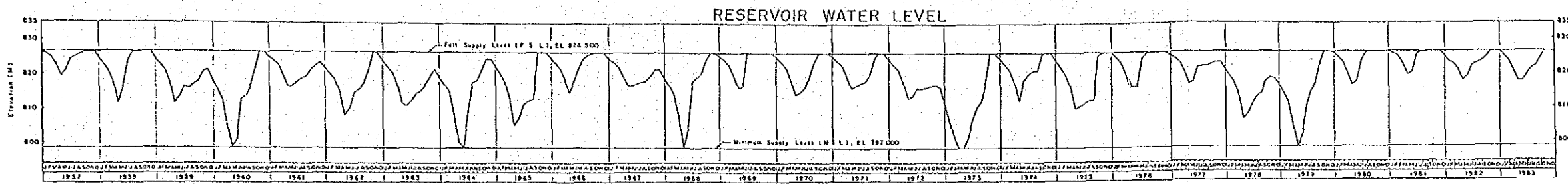




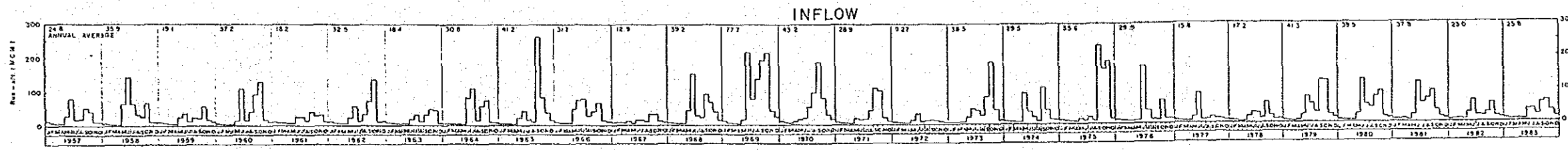
GOVERNMENT OF THE REPUBLIC  
OF HONDURAS  
MINISTRY OF NATURAL RESOURCES  
CHOLUTECA RIVER BASIN  
AGRICULTURAL DEVELOPMENT PROJECT  
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig.  
5-2

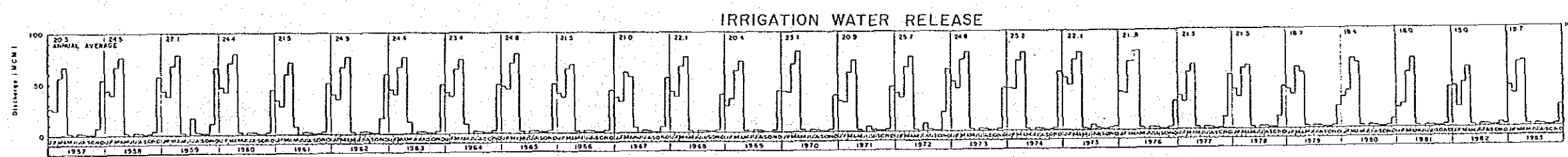
WATER REQUIREMENT FOR  
IRRIGATION



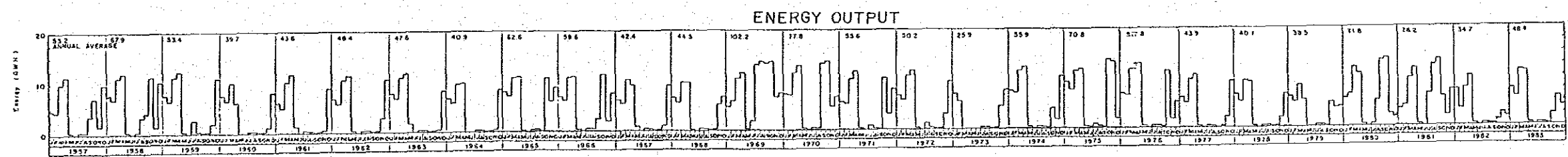
Effective storage - 380 MCM  
 Dead storage - 87 MCM  
 (Reservoir dead storage volume)  
 Gross storage - 467 MCM



Run-off cut at 10% is considered as QUASERIQUE - 7 Dam-out taking return flow of 50% into account.



Irrigation area:  
 (1) San Jos6 Plan - 2,640 ha  
 (2) Middle Reach Canal - 850  
 (3) Western Plain - 14,000  
 (4) Eastern Plain - 4,800  
 Total - 22,300 ha



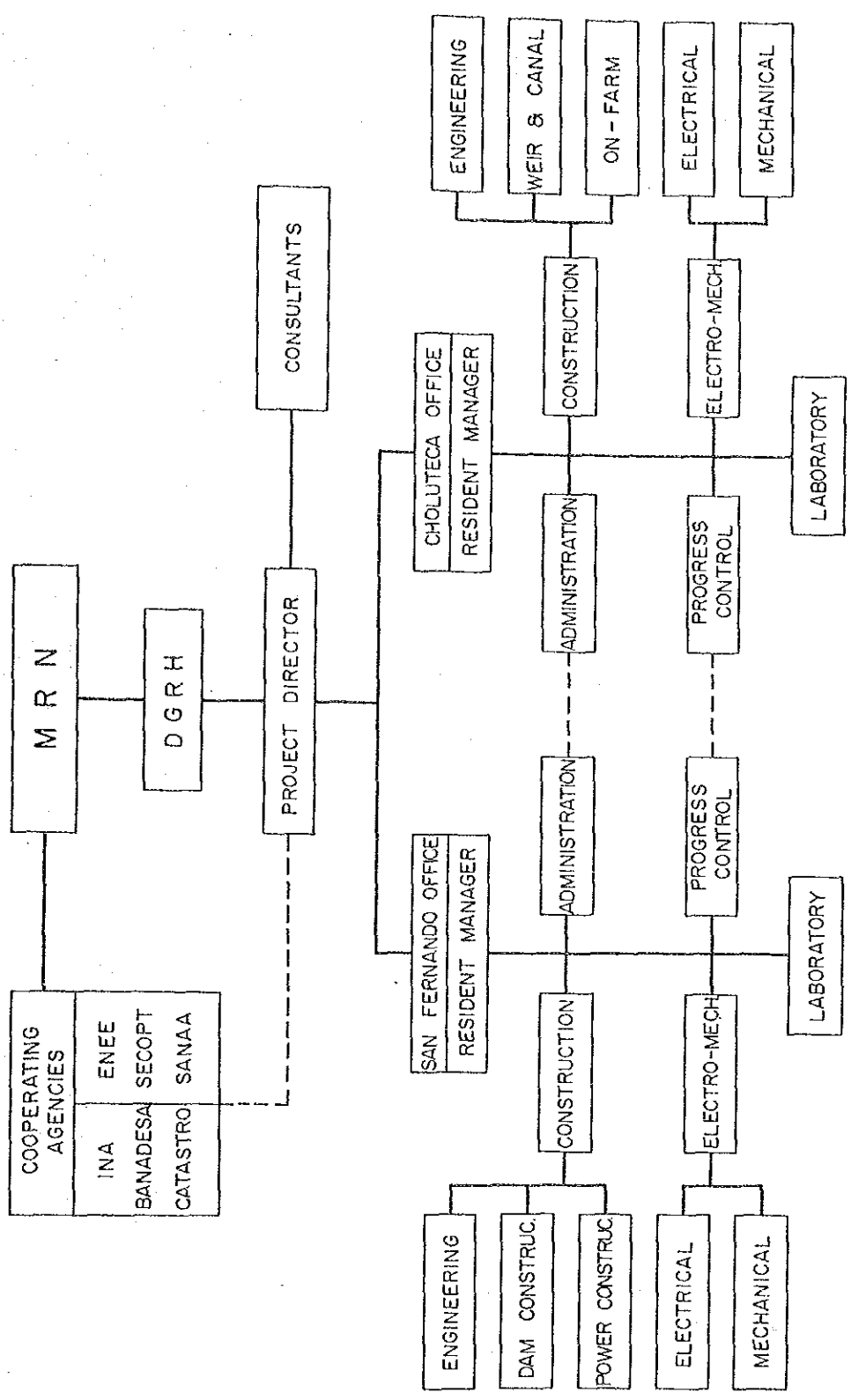
Average annual energy output - 58 GWh (Installed Capacity - 16.2 MW)

GOVERNMENT OF THE REPUBLIC OF HONDURAS MINISTRY OF NATURAL RESOURCES CHOLUTECA RIVER BASIN AGRICULTURAL DEVELOPMENT PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 5-3	RESULT OF RESERVOIR OPERATION (Case 2-2)
---	-------------	---







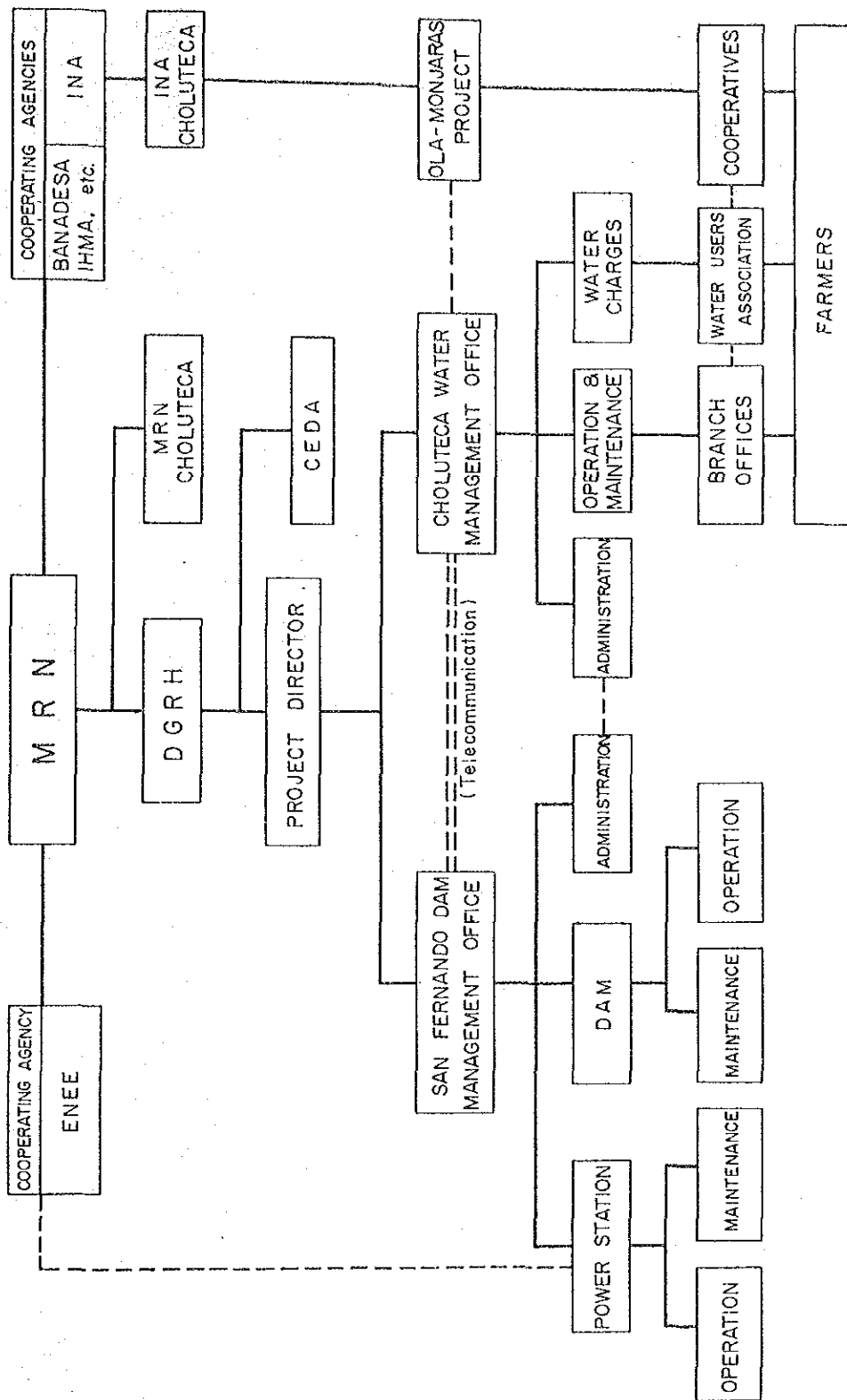


GOVERNMENT OF THE REPUBLIC OF HONDURAS  
 MINISTRY OF NATURAL RESOURCES  
 CHOLUTECA RIVER BASIN AGRICULTURAL DEVELOPMENT PROJECT  
 JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 7-2

ORGANIZATION DURING CONSTRUCTION



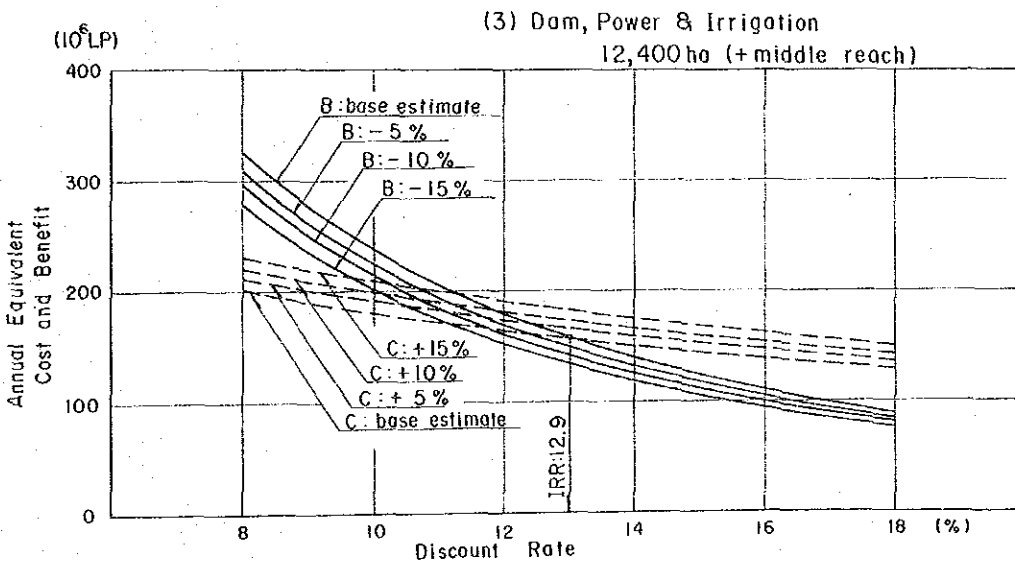
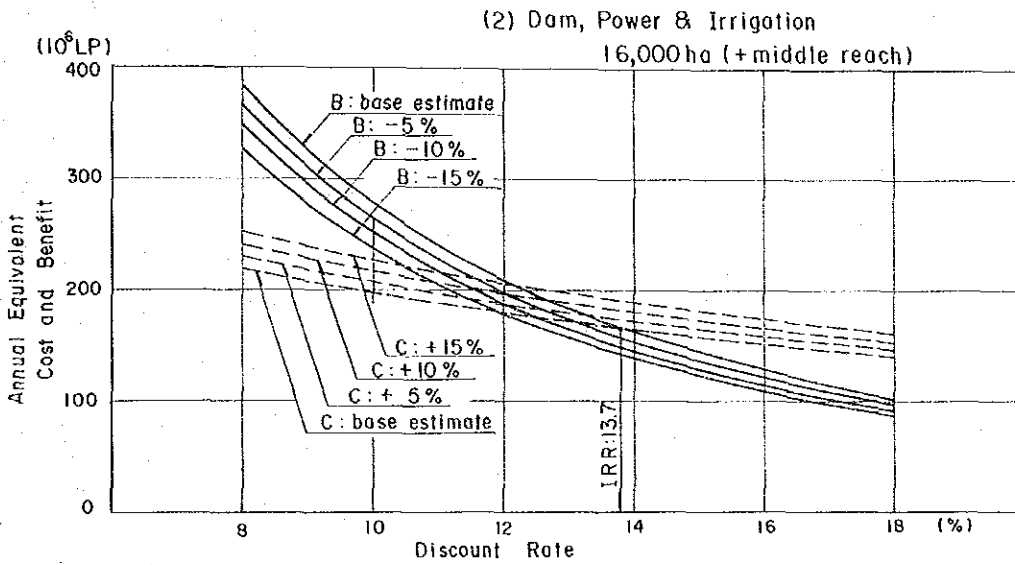
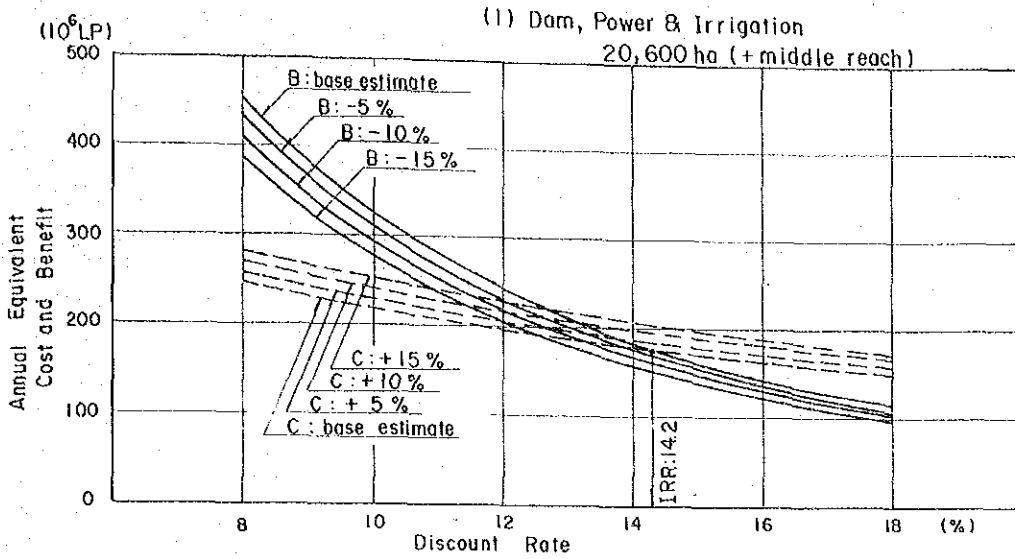


GOVERNMENT OF THE REPUBLIC  
OF HONDURAS  
MINISTRY OF NATURAL RESOURCES  
CHOLUTECA RIVER BASIN  
AGRICULTURAL DEVELOPMENT PROJECT  
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig.  
7-3

ORGANIZATION FOR OPERATION





GOVERNMENT OF THE REPUBLIC  
 OF HONDURAS  
 MINISTRY OF NATURAL RESOURCES  
 CHOLUTECA RIVER BASIN  
 AGRICULTURAL DEVELOPMENT PROJECT  
 JAPAN INTERNATIONAL COOPERATION AGENCY

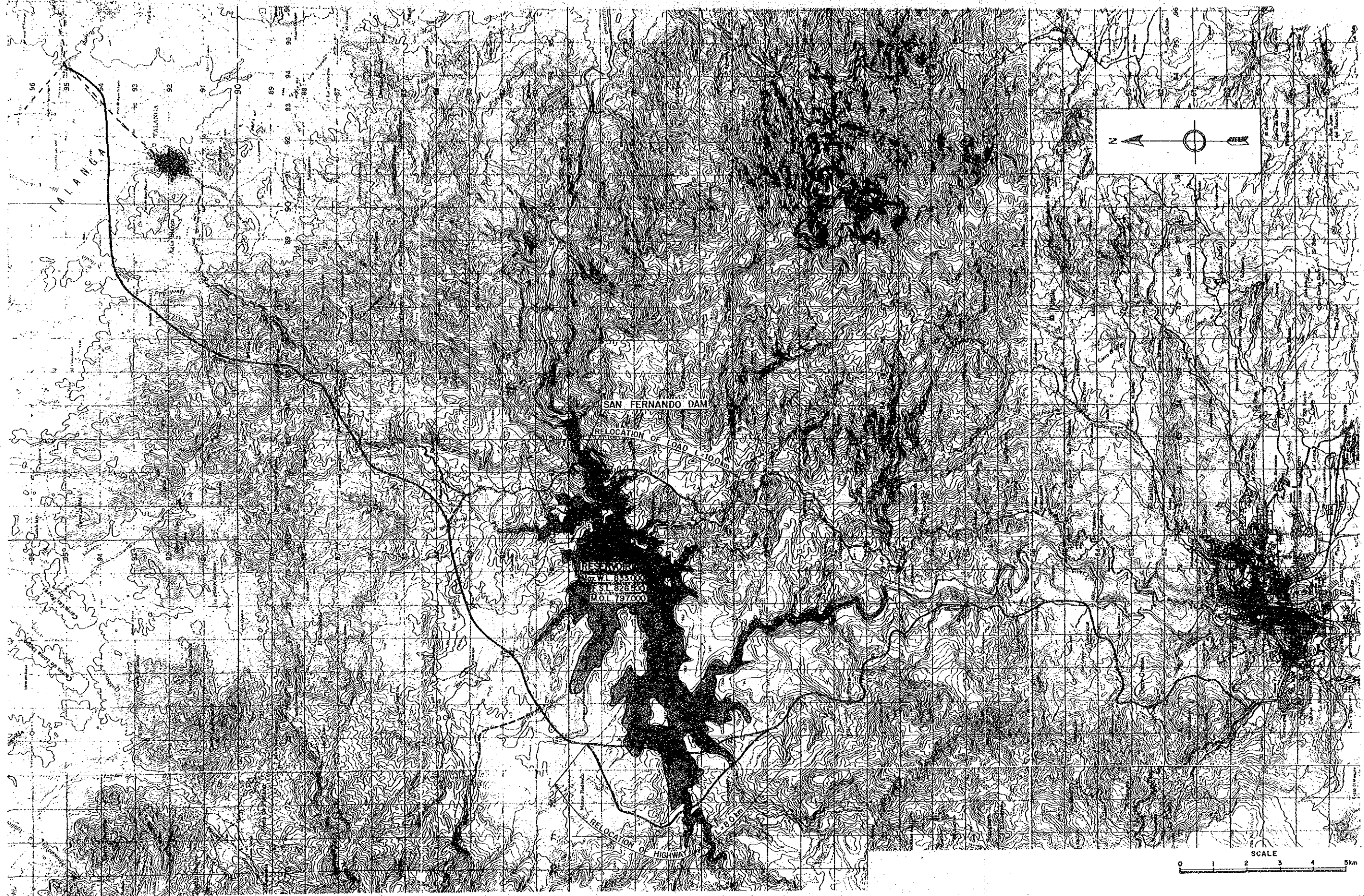
Fig.  
 10-1

SENSITIVITY ANALYSIS OF EIRR



# **DRAWINGS**

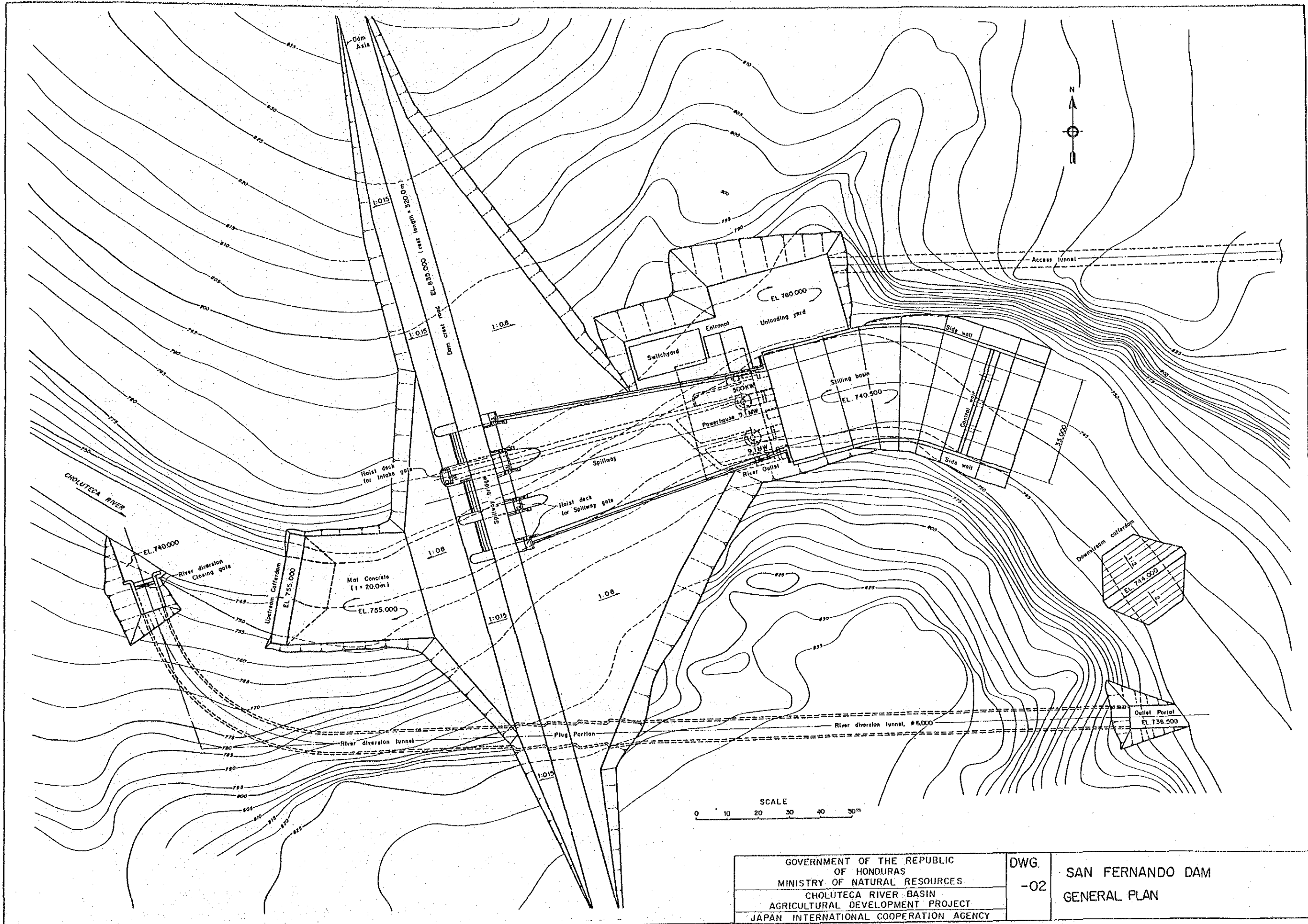




GOVERNMENT OF THE REPUBLIC  
 OF HONDURAS  
 MINISTRY OF NATURAL RESOURCES  
 CHOLUTECA RIVER BASIN  
 AGRICULTURAL DEVELOPMENT PROJECT  
 JAPAN INTERNATIONAL COOPERATION AGENCY

DWG.  
 -01

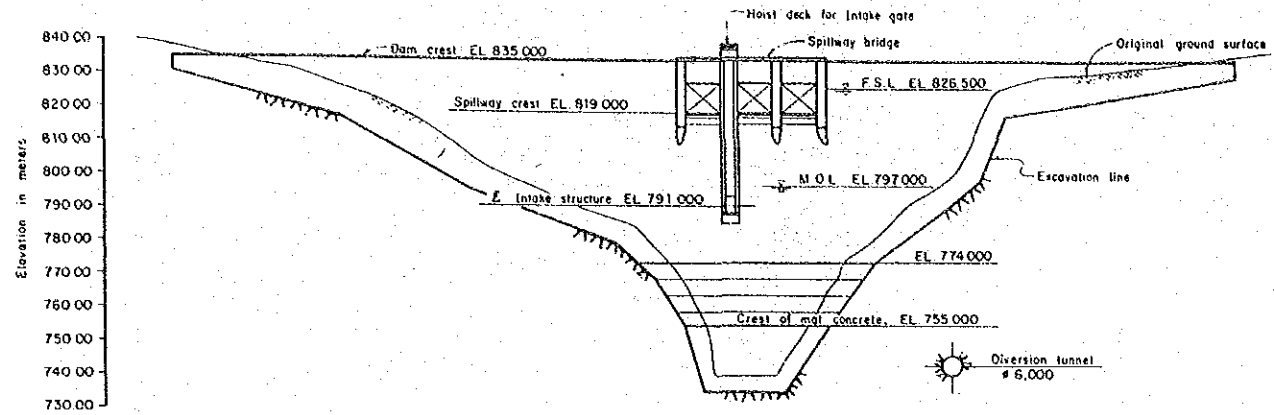
SAN FERNANDO DAM  
 VICINITY MAP



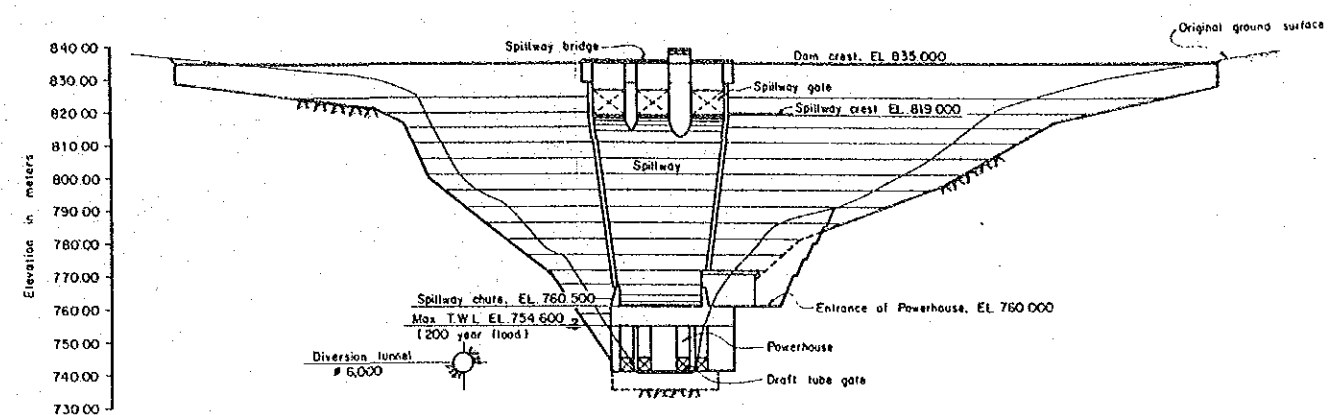
GOVERNMENT OF THE REPUBLIC  
 OF HONDURAS  
 MINISTRY OF NATURAL RESOURCES  
 CHOLUTECA RIVER BASIN  
 AGRICULTURAL DEVELOPMENT PROJECT  
 JAPAN INTERNATIONAL COOPERATION AGENCY

DWG.  
 -02

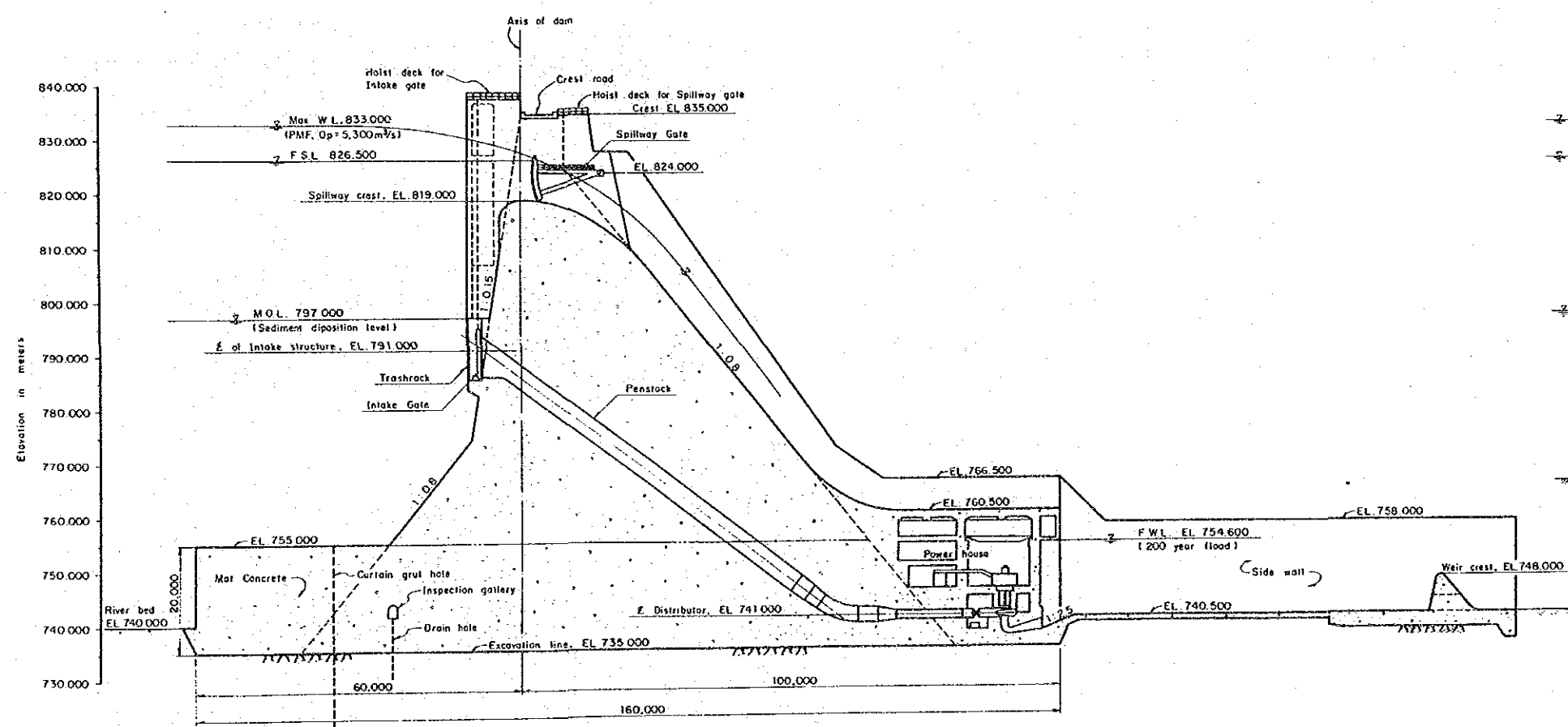
SAN FERNANDO DAM  
 GENERAL PLAN



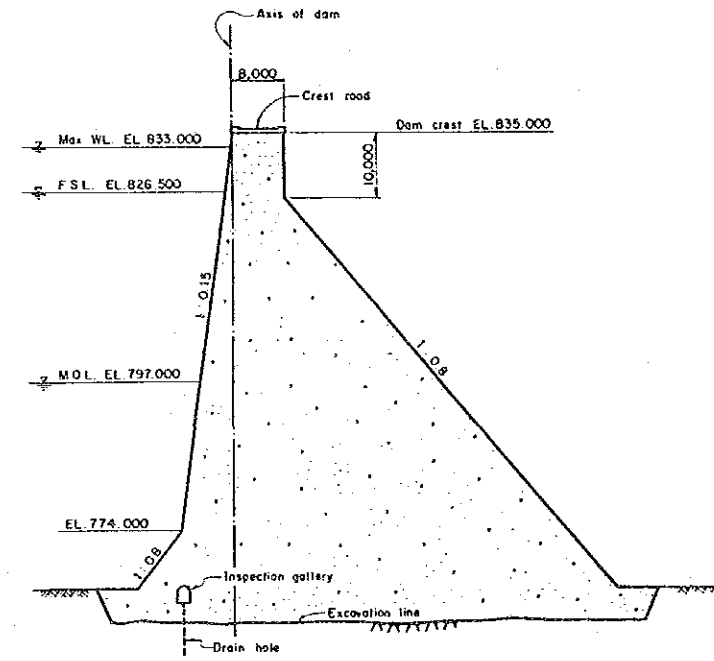
UPSTREAM ELEVATION SCALE A



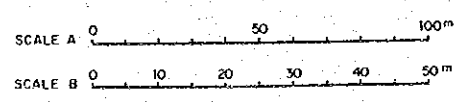
DOWNSTREAM ELEVATION SCALE A



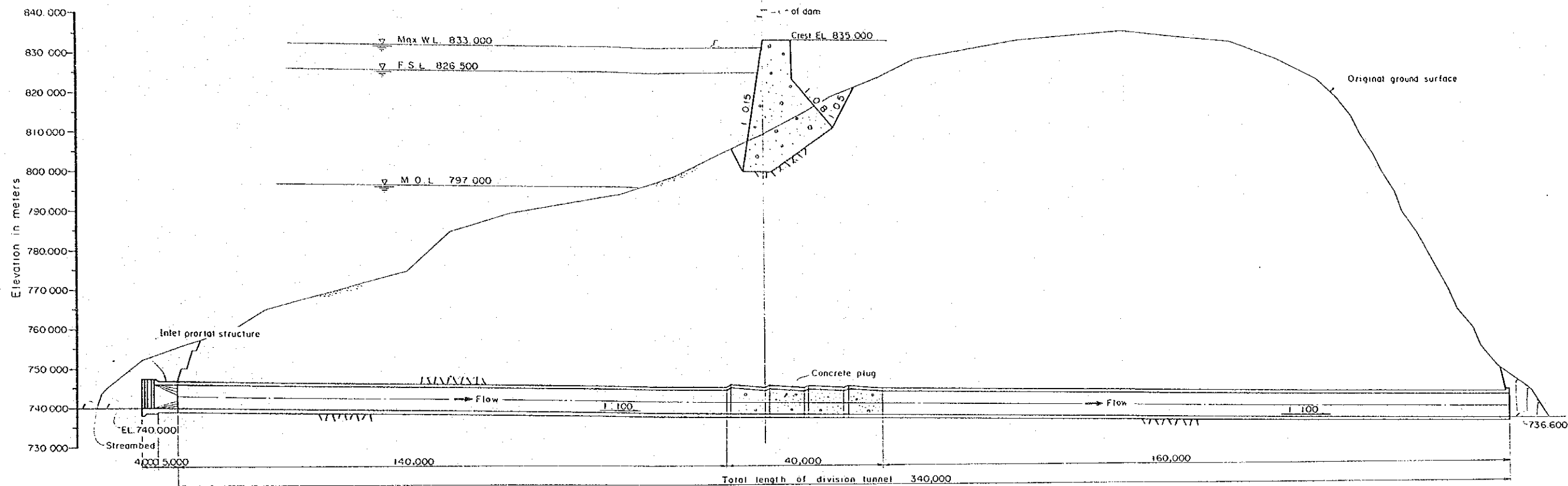
TYPICAL SECTION OF OVERFLOW PORTION SCALE B



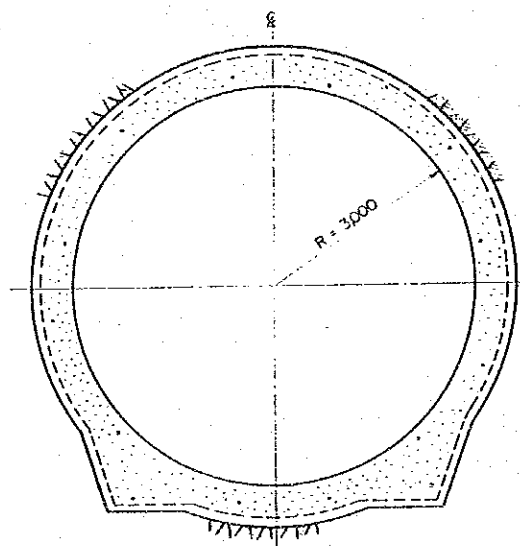
TYPICAL SECTION OF NONOVERFLOW PORTION SCALE B



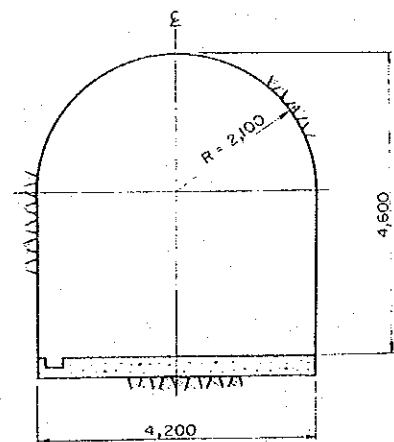
GOVERNMENT OF THE REPUBLIC OF HONDURAS	DWG.	SAN FERNANDO DAM ELEVATIONS AND SECTIONS
MINISTRY OF NATURAL RESOURCES	-03	
CHOLUTECA RIVER BASIN		
AGRICULTURAL DEVELOPMENT PROJECT		
JAPAN INTERNATIONAL COOPERATION AGENCY		



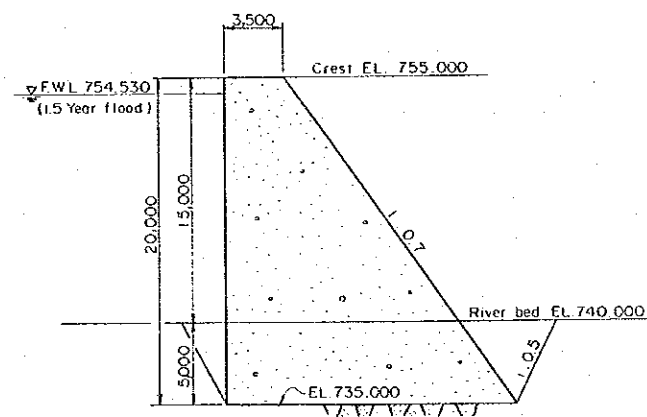
PROFILE ALONG  $\Sigma$  DIVERSION TUNNEL SCALE A



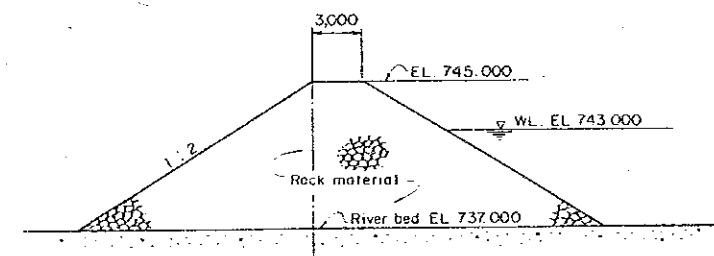
TYPICAL SECTION OF DIVERSION TUNNEL SCALE B



TYPICAL SECTION OF ACCESS ROAD TO POWER HOUSE SCALE B

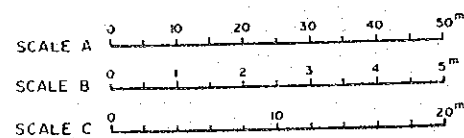


UPSTREAM COFFERDAM



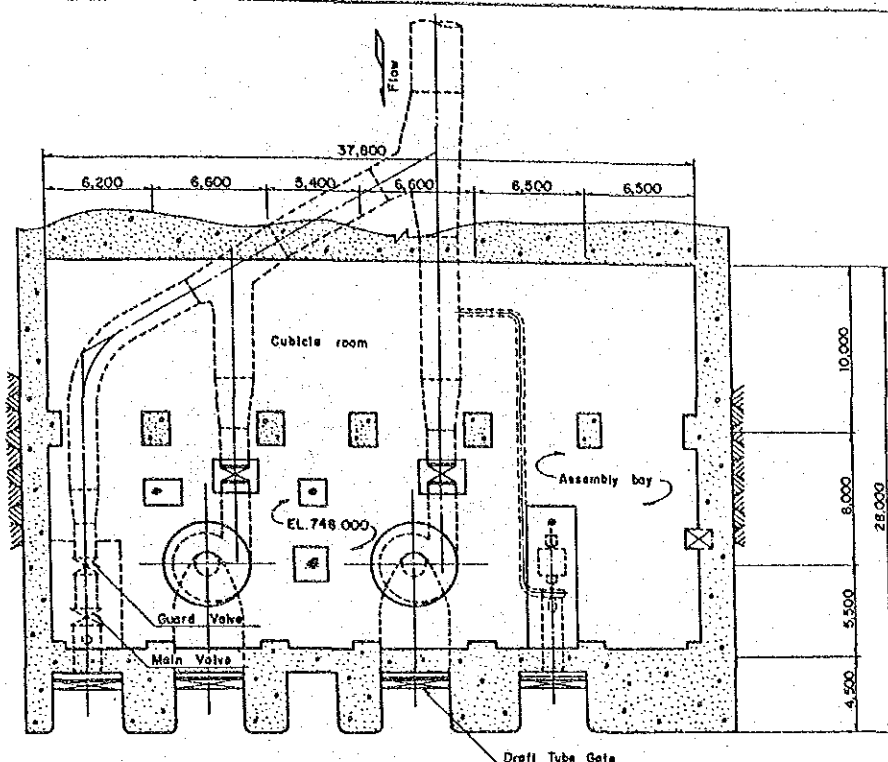
DOWNSTREAM COFFERDAM

TYPICAL SECTION OF COFFERDAMS SCALE C

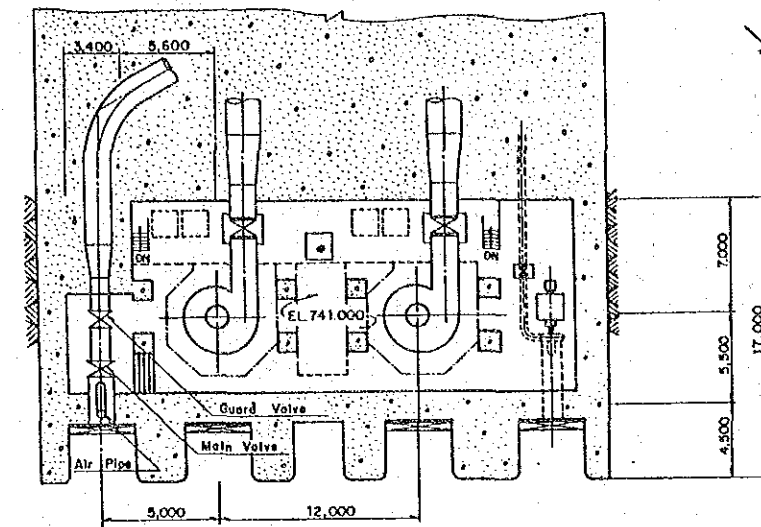


GOVERNMENT OF THE REPUBLIC OF HONDURAS MINISTRY OF NATURAL RESOURCES	DWG.	SAN FERNANDO DAM PROFILE AND SECTIONS
CHOLUTECA RIVER BASIN AGRICULTURAL DEVELOPMENT PROJECT	-04	
JAPAN INTERNATIONAL COOPERATION AGENCY		

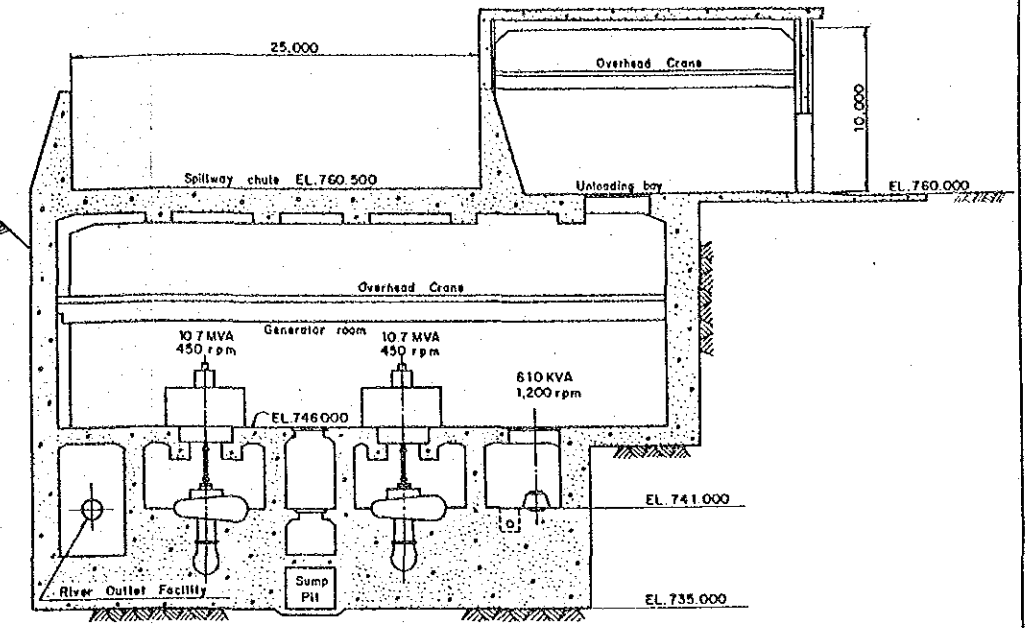




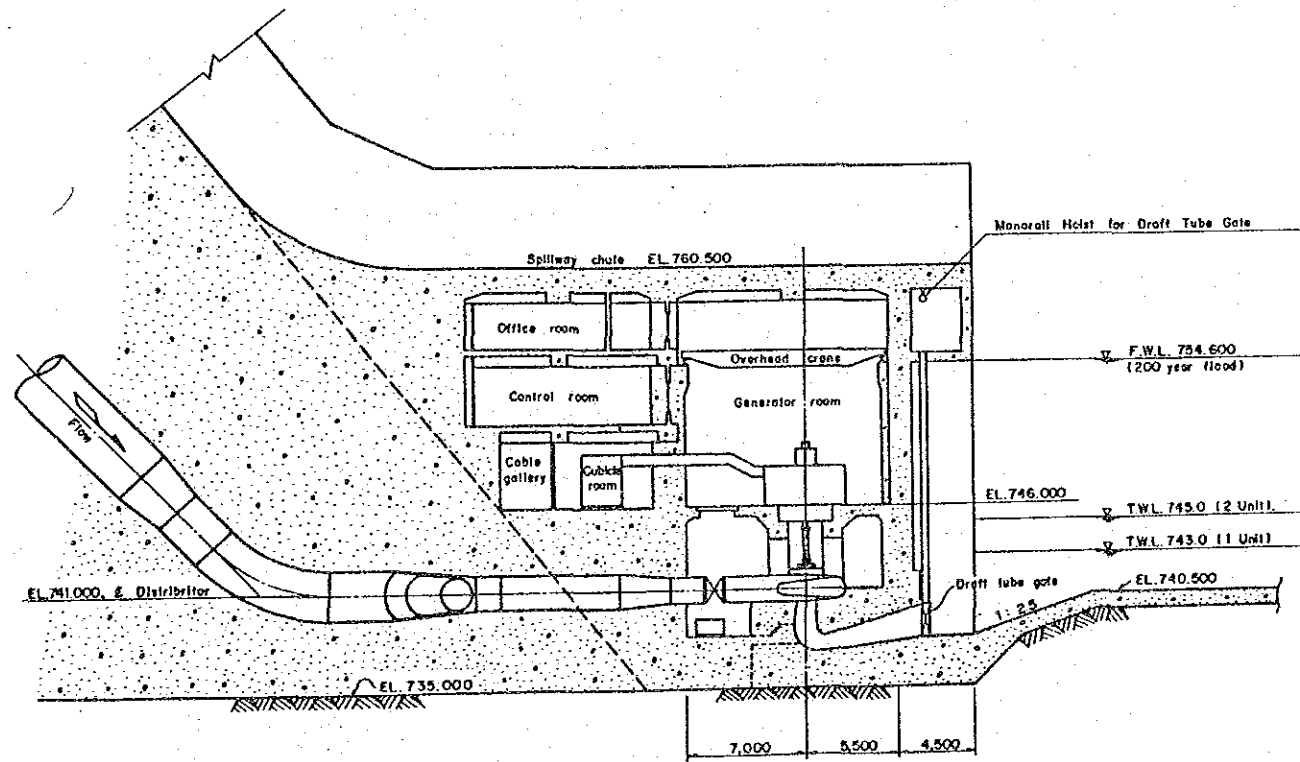
GENERATOR FLOOR PLAN (EL.746.000) SCALE A



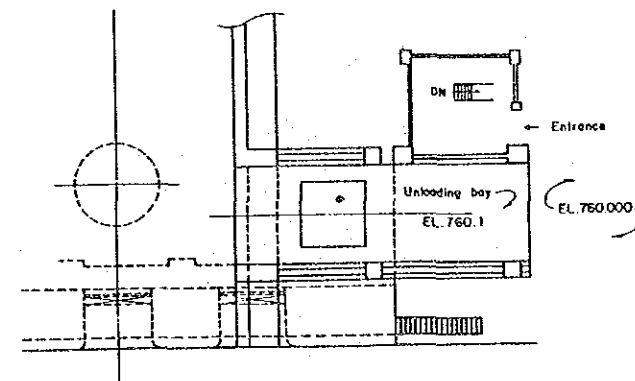
TURBINE FLOOR PLAN (EL.741.000) SCALE A



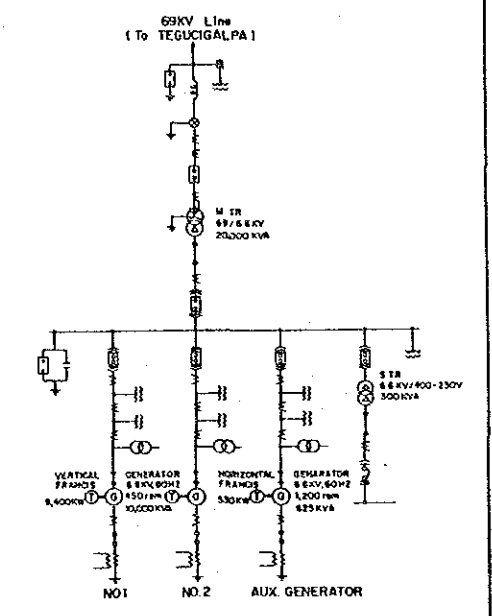
LONGITUDINAL SECTION SCALE A



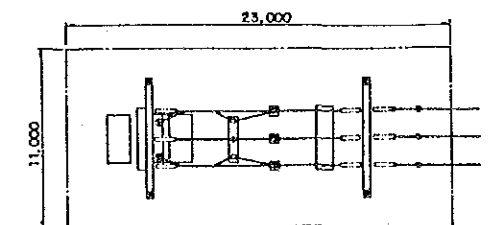
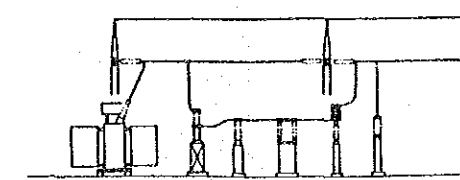
TRANSVERSE SECTION SCALE A



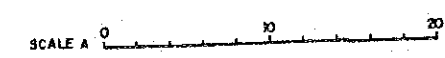
PLAN OF ENTRANCE & UNLOADING BAY SCALE A



SINGLE LINE DIAGRAM NO SCALE



SWITCHYARD SCALE A



GOVERNMENT OF THE REPUBLIC OF HONDURAS MINISTRY OF NATURAL RESOURCES CHOLUTÉCA RIVER BASIN AGRICULTURAL DEVELOPMENT PROJECT JAPAN INTERNATIONAL COOPERATION AGENCY	DWG -05	SAN FERNANDO POWERHOUSE AND SINGLE LINE DIAGRAM
---	------------	--