Table 12 SUMMARY OF THE PROJECT COST

(Unit: ₱10⁶)

Item	Foreign Currency	Local Currency	Total
1. Direct Construction Cost	846.6	315.0	1,161.6
1.1 Gumain Dam	749.6	217.2	966.8
1.2 Diversion Dams	16.4	9.0	25.4
1.3 Irrigation Facilities	61.9	61.7	123.6
1.4 Drainage Facilities	17.8	12.8	30.6
1.5 On-farm Development	0.9	14.3	15.2
2. Compensation Cost for Land Acquisition	-	14.5	14.5
3. Cost of O&M Facilities	8.9	2.1	11.0
4. Administration and Engineering Costs	76.0	68.0	144.0
Sub-total	931.5	399.6	1,331.1
5. Physical Contingency	139.8	60.0	199.8
Total	1,071.3	459.6	1,530.9
6. Price Contingency	563.3	673.8	1,237.1
Grand Total	1,634.6	1,133.4	2,768.0
(US$10⁶)	116.76	80.96	197.72
(¥10⁶)	28,022	19,430	47,452

Remarks: Conversion Rate: US$1.0 = ₱14 = ¥240

Table 13 PROJECT BENEFIT

Crops	With Project			Without Project			Benefit
	Area (ha)	Net Return (₱/ha)	Total Value (₱10³)	Area (ha)	Net Return (₱/ha)	Total Value (₱10³)	(₱10³)
Paddy Field			242,333			84,152	158,181
Wet Season Paddy							
- Gravity Irrigation Area	11,000	10,050	110,550	5,970	5,876	35,080	
- Pump Irrigation Area	-	-	-	1,100	5,131	5,644	
- Rainfed Area	-	-	-	4,060	3,213	13,045	
Dry Season Paddy							
- Gravity Irrigation Area	6,000	11,430	68,580	4,540	5,248	23,826	
- Pump Irrigation Area	-	-	-	820	4,219	3,460	
Diversified Crops (Fruit Vegetables)	1,800	35,113/1	63,203	170	18,216	3,097	
Sugarcane Field			209,145			91,379	117,766
Sugarcane	5,750	34,831/2	200,278	5,900	15,488/2	91,379	
Intercrops	(5,750)	1,542	8,867	-	-	-	
Total			451,478			175,531	275,947

Remarks: /1: Average net return of ampalaya and tomato.
/2: Average net return of plant cane and ratoon cane.

Note : Project benefit is estimated on the basis of the price level and exchange rate (US$1.0 = ₱14.0) as of March, 1984.

Table 14 ECONOMIC CONSTRUCTION COST

(Unit: ₱10⁶)

Item	Total	1986	1987	1988	1989	1990	1991	1992
1. Direct Construction Cost	960.7	-	163.7	158.3	123.1	199.2	168.0	148.4
1.1 Gumain Dam	799.4	-	154.3	141.4	99.6	143.9	130.1	130.1
1.2 Diversion Dam	21.0	-	0.8	3.0	-	8.6	8.6	-
1.3 Irrigation Facilities	102.4	-	8.6	13.9	19.0	30.7	15.1	15.1
1.4 Drainage Facilities	25.4	-	-	-	4.5	8.8	8.9	3.2
1.5 On - Farm Development	12.5	-	-	-	-	7.2	5.3	-
2. Cost for O & M Facilities	9.1	-	-	-	-	6.6	-	2.5
3. Administrative Cost and Engineering Cost	119.1	34.7	14.1	16.5	16.5	14.1	12.4	10.8
Sub - total	1,088.9	34.7	177.8	174.8	139.6	219.9	180.4	161.7
4. Physical Contingency	163.4	5.2	26.7	26.2	20.9	33.0	27.1	24.3
Total	1,252.3	39.9	204.5	201.0	160.5	252.9	207.5	186.0

This economic cost is estimated on the basis of the price level and exchange rate (US$1.0 = ₱14.0) as of March, 1984.

Table 15 ANNUAL ECONOMIC COST AND BENEFIT FLOW

(Unit: ₱10⁶)

Year	Year in Order	Economic Cost: Construction Cost	Economic Cost: Replacement Cost	Economic Cost: O&M Cost	Total	Economic Benefit
1986	1	39.9	0	0	39.9	0
1987	2	204.5	0	0	204.5	0
1988	3	201.0	0	0	201.0	0
1989	4	160.5	0	0	160.5	0
1990	5	252.9	0	0.8	253.7	3.9
1991	6	207.5	0	1.6	209.1	11.7
1992	7	186.0	0	1.6	187.6	19.6
1993	8	0	0	3.9	3.9	74.7
1994	9	0	0	3.9	3.9	129.9
1995	10	0	0	3.9	3.9	181.2
1996	11	0	0	3.9	3.9	228.6
1997	12	0	0	3.9	3.9	275.9
1998	13	0	0	3.9	3.9	275.9
1999	14	0	0	3.9	3.9	275.9
2000	15	0	5.5	3.9	9.4	275.9
2001	16	0	0	3.9	3.9	275.9
2002	17	0	2.5	3.9	6.4	275.9
2003	18	0	0	3.9	3.9	275.9
⋮	⋮	⋮	⋮	⋮	⋮	⋮
2009	24	0	0	3.9	3.9	275.9
2010	25	0	5.5	3.9	9.4	275.9
2011	26	0	0	3.9	3.9	275.9
2012	27	0	2.5	3.9	6.4	275.9
2013	28	0	18.0	3.9	21.9	275.9
2014	29	0	0.6	3.9	4.5	275.9
2015	30	0	0.2	3.9	4.1	275.9
2016	31	0	1.1	3.9	5.0	275.9
2017	32	0	0.3	3.9	4.2	275.9
2018	33	0	0	3.9	3.9	275.9
2019	34	0	0	3.9	3.9	275.9
2020	35	0	5.5	3.9	9.4	275.9
2021	36	0	0	3.9	3.9	275.9
2022	37	0	2.5	3.9	6.4	275.9
2023	38	0	0	3.9	3.9	275.9
⋮	⋮	⋮	⋮	⋮	⋮	⋮
2029	44	0	0	3.9	3.9	275.9
2030	45	0	5.5	3.9	9.4	275.9
2031	46	0	0	3.9	3.9	275.9
2032	47	0	2.5	3.9	6.4	275.9
2033	48	0	0	3.9	3.9	275.9
2034	49	0	0	3.9	3.9	275.9
2035	50	0	0	3.9	3.9	275.9

Table 16 CASH FLOW STATEMENT

(Unit: ₱10⁶)

Year	Year in Order	Cash Outflow: Capital Cost F.C./1	Capital Cost L.C./2	Loan Repayment/3 Interest	Loan Repayment/3 Principal	O&M Cost	Replacement	Reimbursement/4 and Incentive for Irrigation Fee	Total	Cash Inflow: Construction Fund F.C.	Construction Fund L.C.	Revenue/5	Government Subsidy	Total	Balance
1989	1	44.7	13.2	-	-	-	-	-	57.9	44.7	13.2	-	-	57.9	0
1987	2	233.8	129.1	1.6	-	-	-	-	364.5	233.8	129.1	-	1.6	364.5	0
1988	3	247.5	147.5	9.7	-	-	-	-	404.7	247.5	147.5	-	9.7	404.7	0
1989	4	209.8	137.0	18.4	-	-	-	-	365.2	209.8	137.0	-	18.4	365.2	0
1990	5	324.2	262.0	25.8	-	0.9	-	0.2	613.1	324.2	262.0	1.0	25.9	613.1	0
1991	6	286.6	233.4	37.1	-	1.9	-	0.3	559.3	286.6	233.4	2.0	37.3	559.3	0
1992	7	285.3	211.2	47.1	-	1.9	-	0.3	545.8	285.3	211.2	2.0	47.3	545.8	0
1993	8	-	-	57.1	-	4.7	-	1.2	63.0	-	-	7.8	55.2	63.0	0
1994	9	-	-	57.1	-	4.7	-	1.2	63.0	-	-	7.8	55.2	63.0	0
1995	10	-	-	57.1	-	4.7	-	1.2	63.0	-	-	7.8	55.2	63.0	0
1996	11	-	-	57.1	81.6	4.7	-	1.2	144.6	-	-	7.8	136.8	144.6	0
1997	12	-	-	54.3	81.6	4.7	-	1.2	141.8	-	-	7.8	134.0	141.8	0
1998	13	-	-	51.4	81.6	4.7	-	1.2	138.9	-	-	7.8	131.1	138.9	0
1999	14	-	-	48.5	81.6	4.7	-	1.2	136.0	-	-	7.8	128.2	136.0	0
2000	15	-	-	45.7	81.6	4.7	6.6	1.2	139.8	-	-	7.8	132.0	139.8	0
2001	16	-	-	42.8	81.6	4.7	-	1.2	130.3	-	-	7.8	122.5	130.3	0
2002	17	-	-	40.0	81.6	4.7	3.0	1.2	130.5	-	-	7.8	122.7	130.5	0
2003	18	-	-	37.1	81.6	4.7	-	1.2	124.6	-	-	7.8	116.8	124.6	0
2004	19	-	-	34.3	81.6	4.7	-	1.2	121.8	-	-	7.8	114.0	121.8	0
2005	20	-	-	31.4	81.6	4.7	-	1.2	118.9	-	-	7.8	111.1	118.9	0
2006	21	-	-	28.6	81.6	4.7	-	1.2	116.1	-	-	7.8	108.3	116.1	0
2007	22	-	-	25.7	81.6	4.7	-	1.2	113.2	-	-	7.8	105.4	113.2	0
2008	23	-	-	22.8	81.6	4.7	-	1.2	110.3	-	-	7.8	102.5	110.3	0
2009	24	-	-	20.0	81.6	4.7	-	1.2	107.5	-	-	7.8	99.7	107.5	0
2010	25	-	-	17.1	81.6	4.7	6.6	1.2	111.2	-	-	7.8	103.4	111.2	0
2011	26	-	-	14.3	81.6	4.7	-	1.2	101.8	-	-	7.8	94.0	101.8	0
2012	27	-	-	11.4	81.6	4.7	3.0	1.2	101.9	-	-	7.8	94.1	101.9	0
2013	28	-	-	8.6	81.6	4.7	21.0	1.2	117.1	-	-	7.8	109.3	117.1	0
2014	29	-	-	5.7	81.6	4.7	0.8	1.2	94.0	-	-	7.8	86.2	94.0	0
2015	30	-	-	2.9	81.6	4.7	0.2	1.2	90.6	-	-	7.8	82.8	90.6	0
2016	31	-	-	0	0	4.7	1.3	1.2	7.2	-	-	7.8	-	7.8	0.6

Remarks: /1: Foreign Currency Portion. /2: Local Currency Portion

/3: Interest; 3.5%
Grace period: 10 years
Repayment period including grace period: 30 years

/4: 10%; Back payment to farmers under full payment condition.
5%; Incentive to FIAs under full payment condition.

/5: Revenue from irrigation fee to be collected from farmer.

This analysis is made on the basis of the price level and exchange rate (US$1.0 = ₱14.0) as of March, 1984.

FIGURES

Fig. 1 ADMINISTRATIVE BOUNDARIES IN THE STUDY AREA

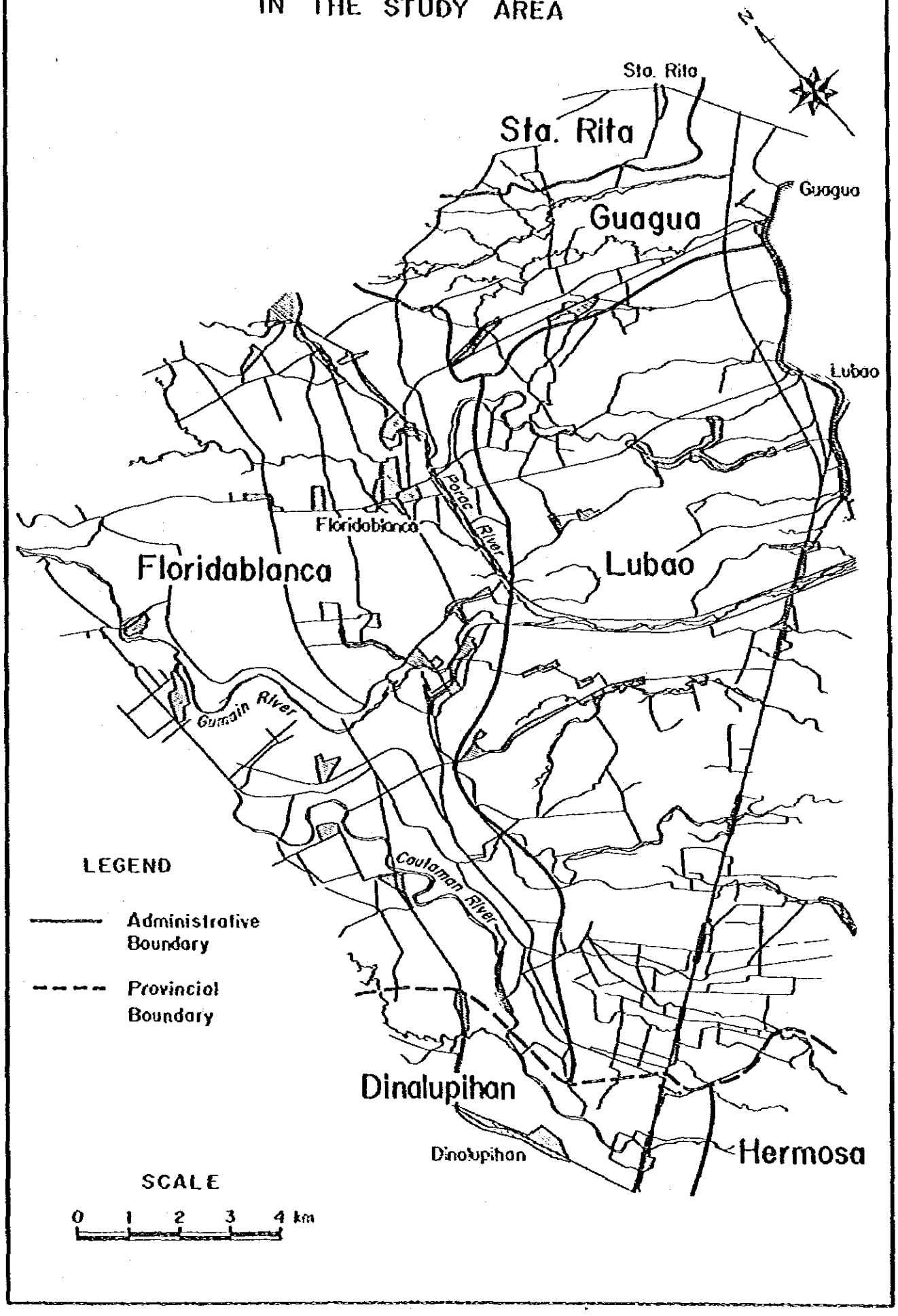


Fig. 2 CLIMATE MAP OF THE PHILIPPINES

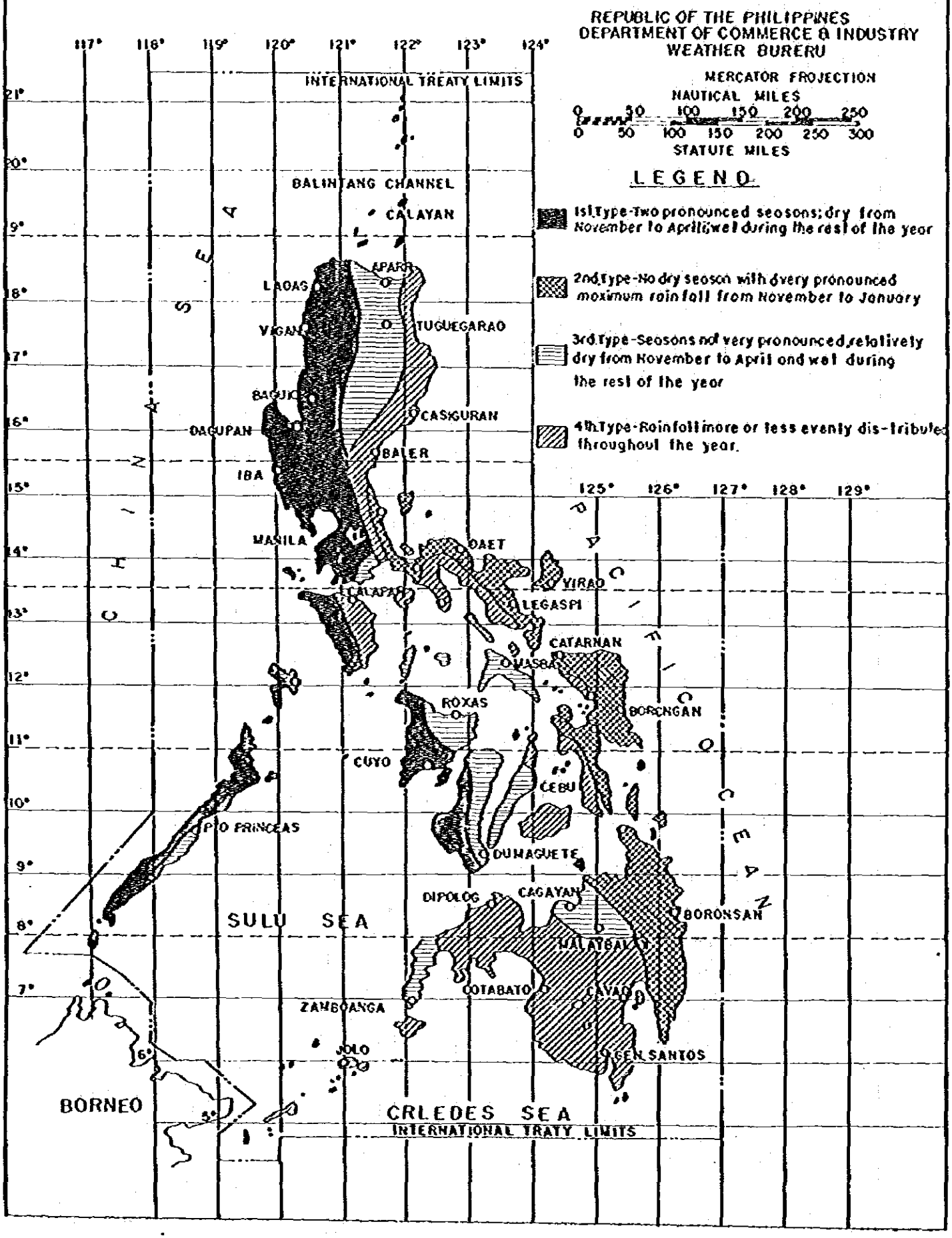
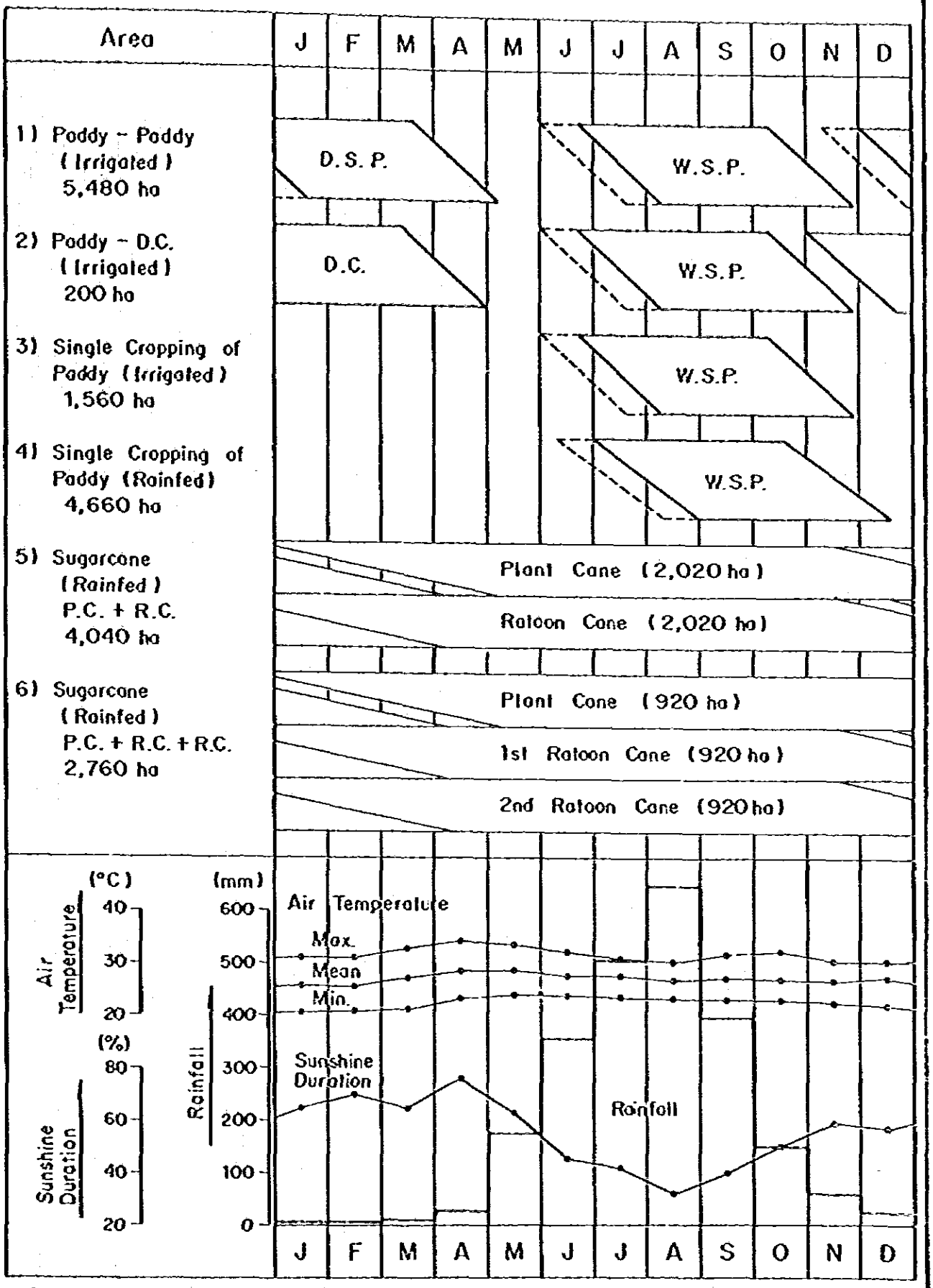


Fig. 3 PRESENT CROPPING PATTERN



Remarks : W.S.P. — Wet Season Paddy
D.S.P. — Dry Season Paddy
D.C. — Diversified Crops
P.C. — Plant Cane
R.C. — Ratoon Cane

Fig. 4 SYSTEMATIC DIAGRAM FOR WATER BALANCE STUDY

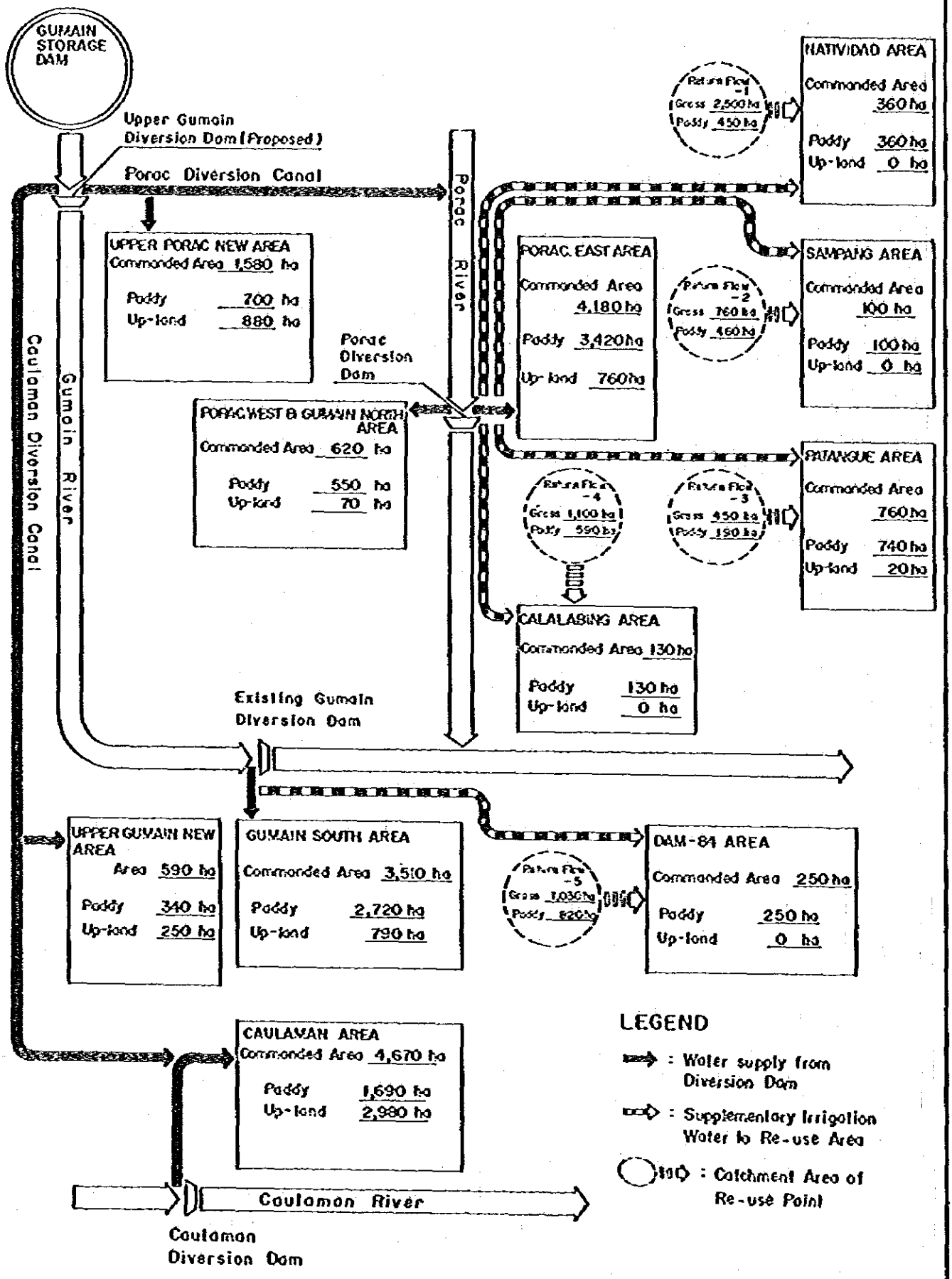
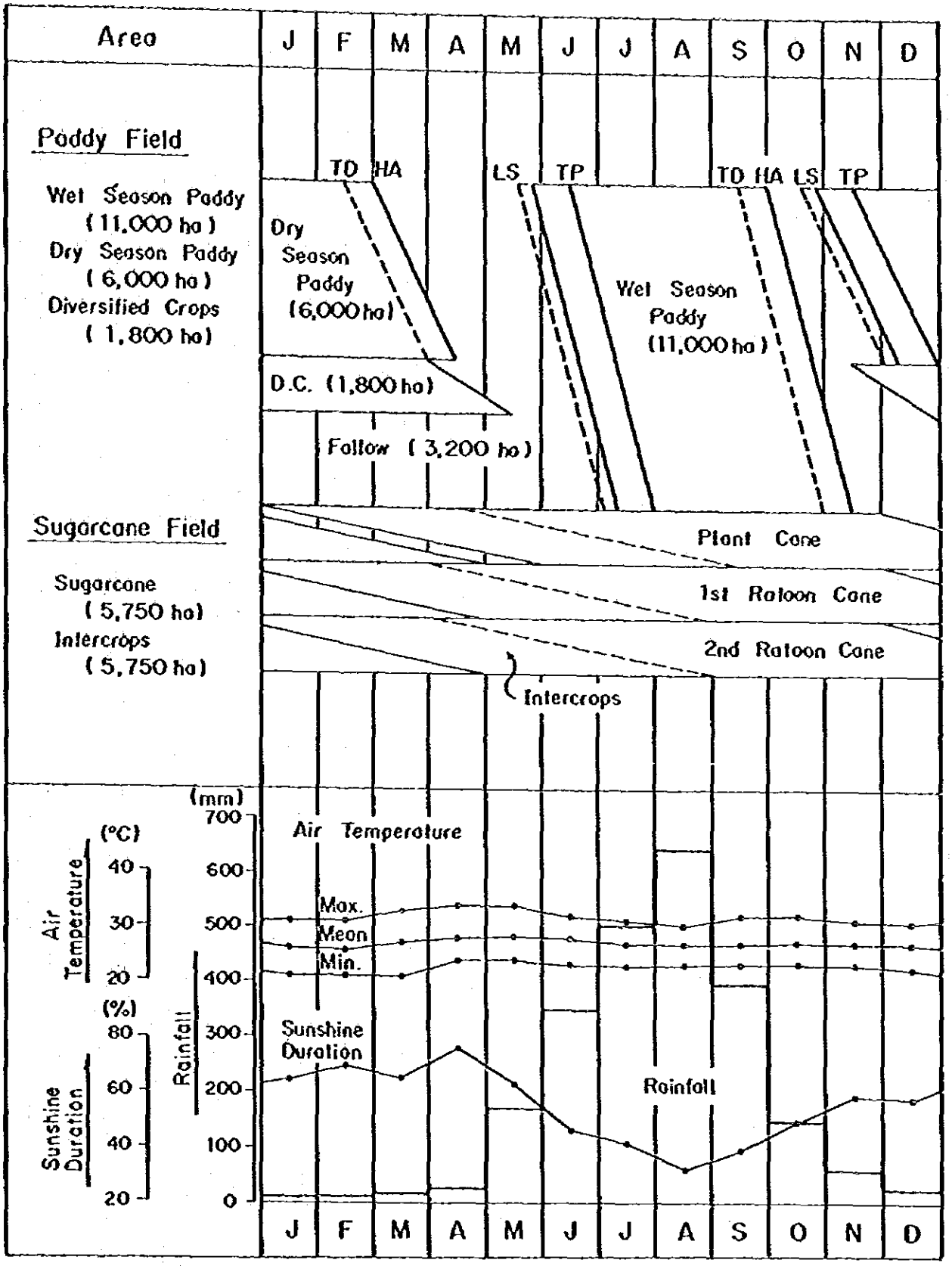
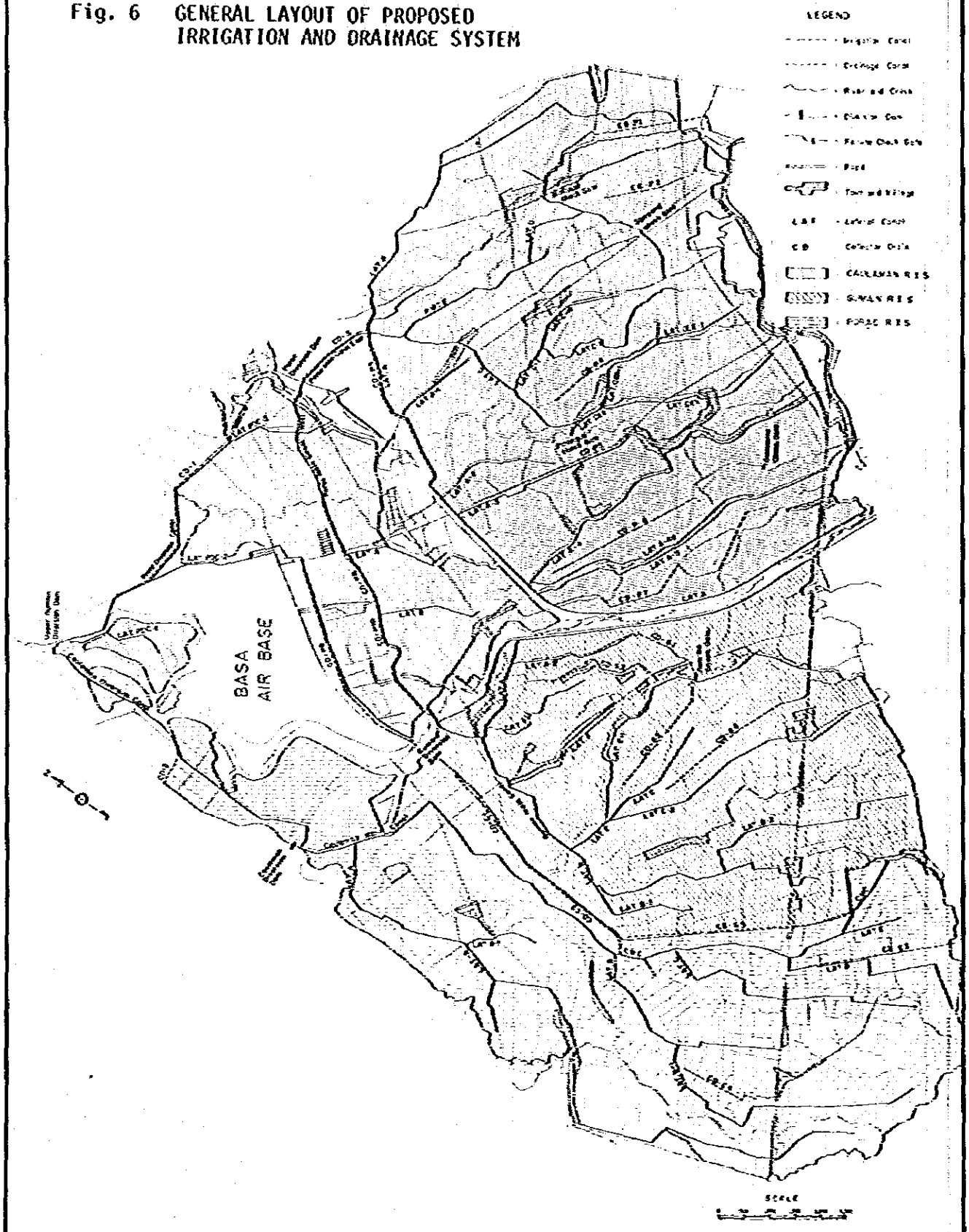


Fig. 5 PROPOSED CROPPING PATTERN



Remarks : LS – Land Soaking TD – Terminal Drainage
TP – Transplanting HA – Harvesting
D.C. – Diversified Crops (Fruit Vegetables)

Fig. 6 GENERAL LAYOUT OF PROPOSED IRRIGATION AND DRAINAGE SYSTEM



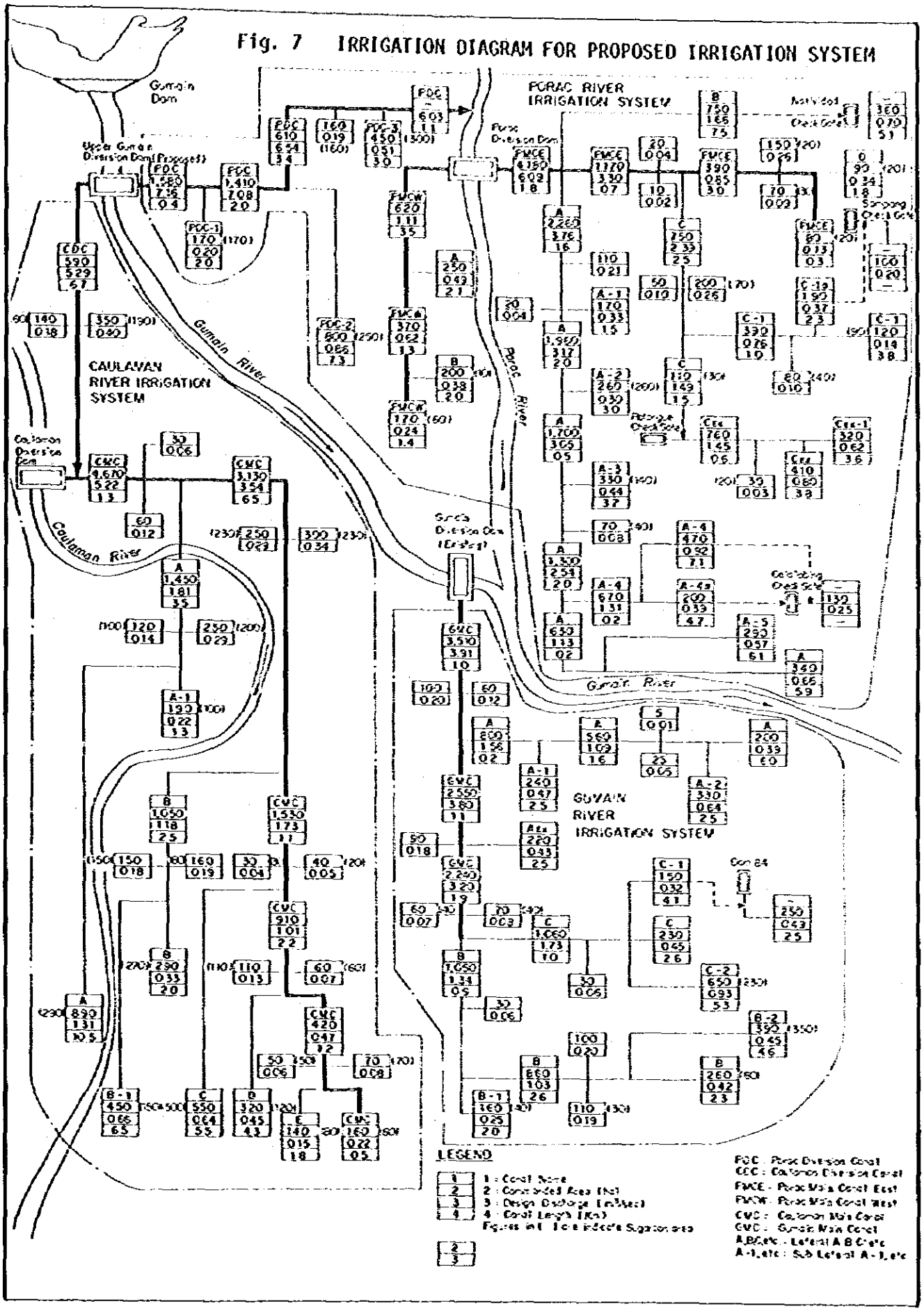


Fig. 7 IRRIGATION DIAGRAM FOR PROPOSED IRRIGATION SYSTEM
Gumain Dam
Upper Gumain Diversion Dam (Proposed)
PORAC RIVER IRRIGATION SYSTEM
Porac Diversion Dam
CAULAYAN RIVER IRRIGATION SYSTEM
Gumain River
Porac River
Caulayan Diversion Dam
Caulayan River
Sunca Diversion Dam (Existing)
GUMAIN RIVER IRRIGATION SYSTEM
LEGEND
1 : Canal Name
2 : Commanded Area (Ha)
3 : Design Discharge (m³/sec)
4 : Canal Length (Km)
Figures in ( ) are indicate Supplementary area
PDC : Porac Diversion Canal
CDC : Caulayan Diversion Canal
PMCE - Porac Main Canal East
PMCW - Porac Main Canal West
CMC : Caulayan Main Canal
GMC : Gumain Main Canal
A,B,C,etc : Lateral A B C etc
A-1,etc : Sub Lateral A-1, etc

Fig. 8 PROPOSED DRAINAGE SYSTEM

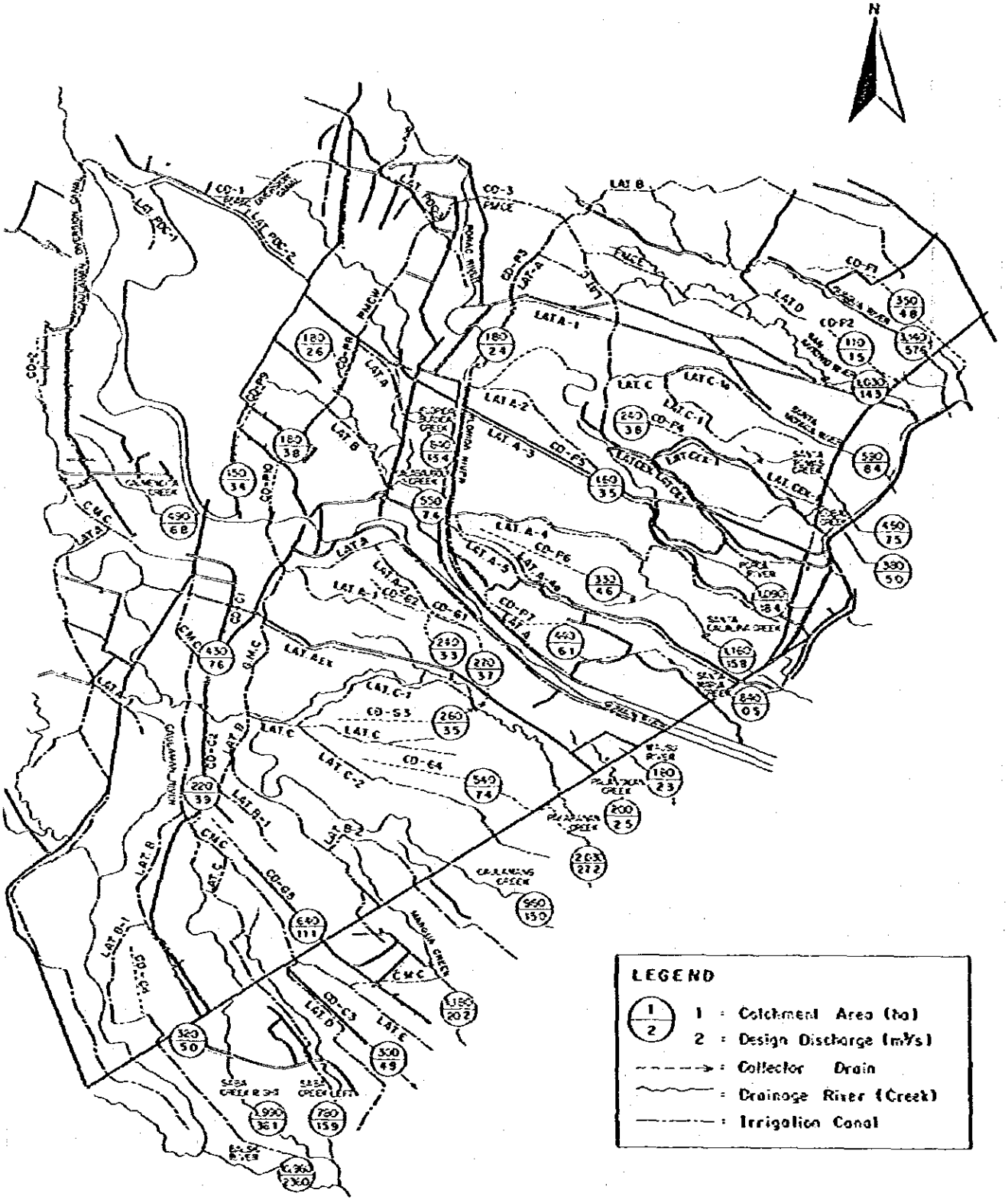


Fig. 9 ELEVATION-AREA, CAPACITY RELATIONSHIP OF GUMAIN RESERVOIR

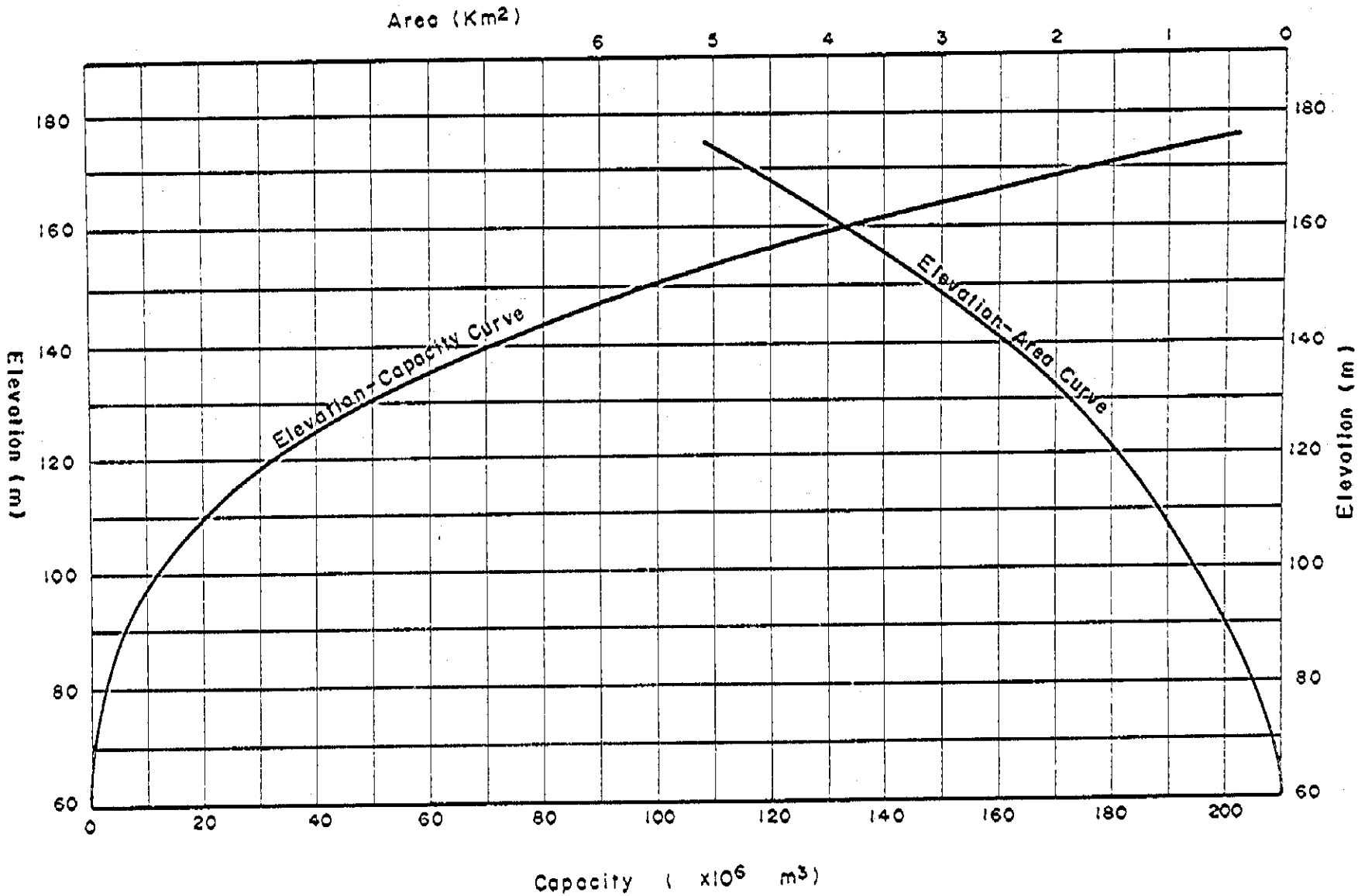


Fig. 10 TYPICAL SECTION OF GUMAIN DAM

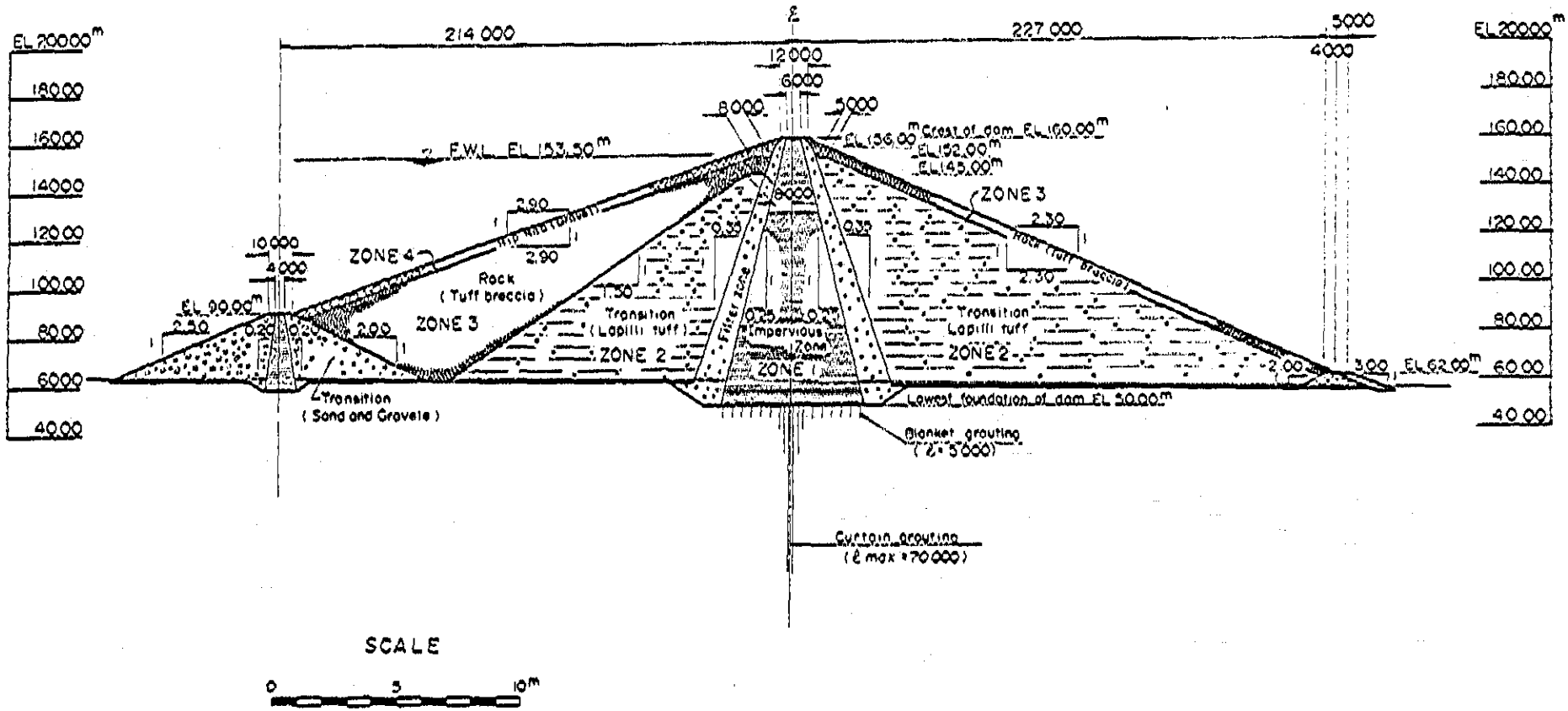


Fig. 11 IMPLEMENTATION SCHEDULE OF THE PROJECT

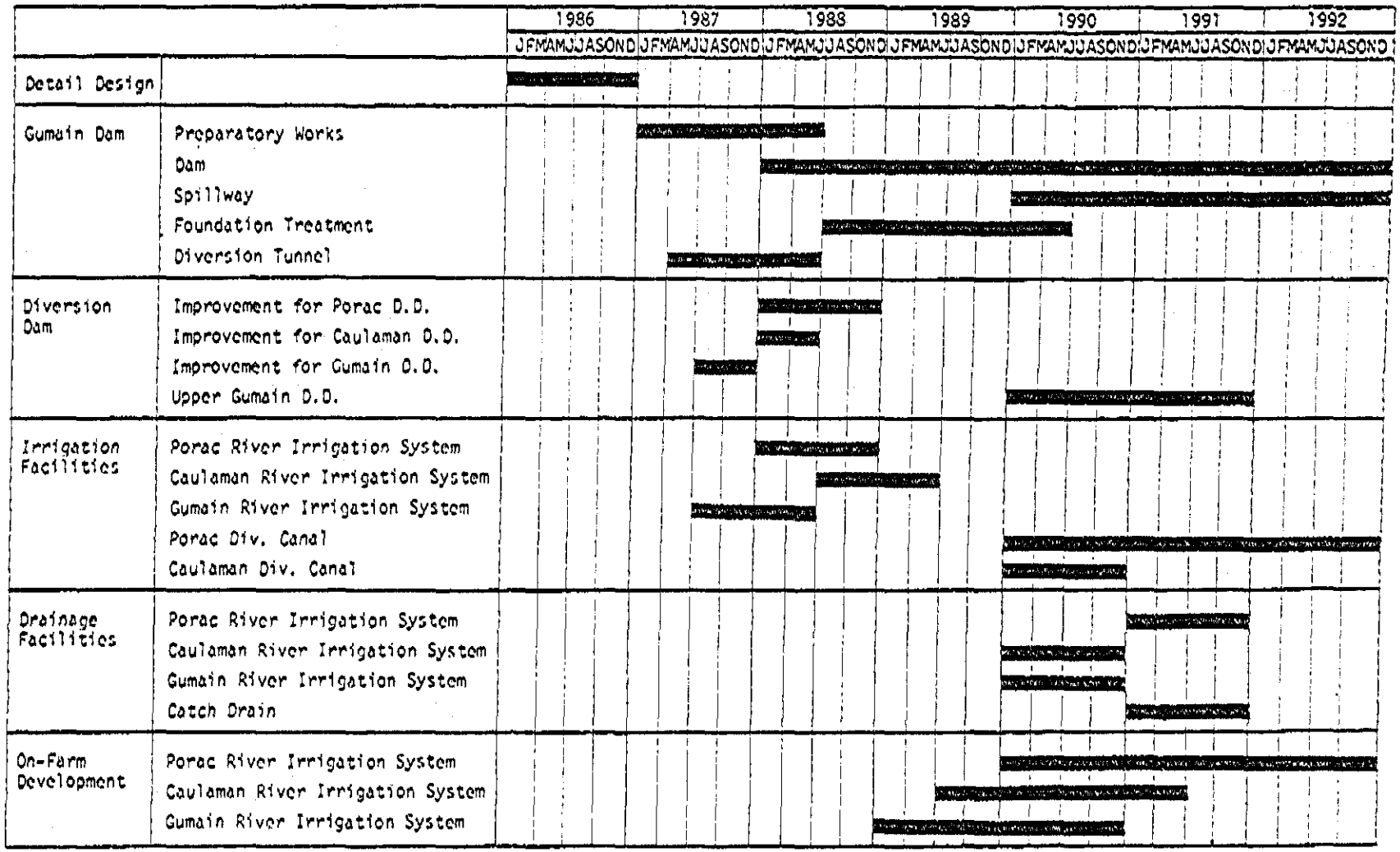


Fig. 12 PROPOSED ORGANIZATION OF PROJECT EXECUTING OFFICE

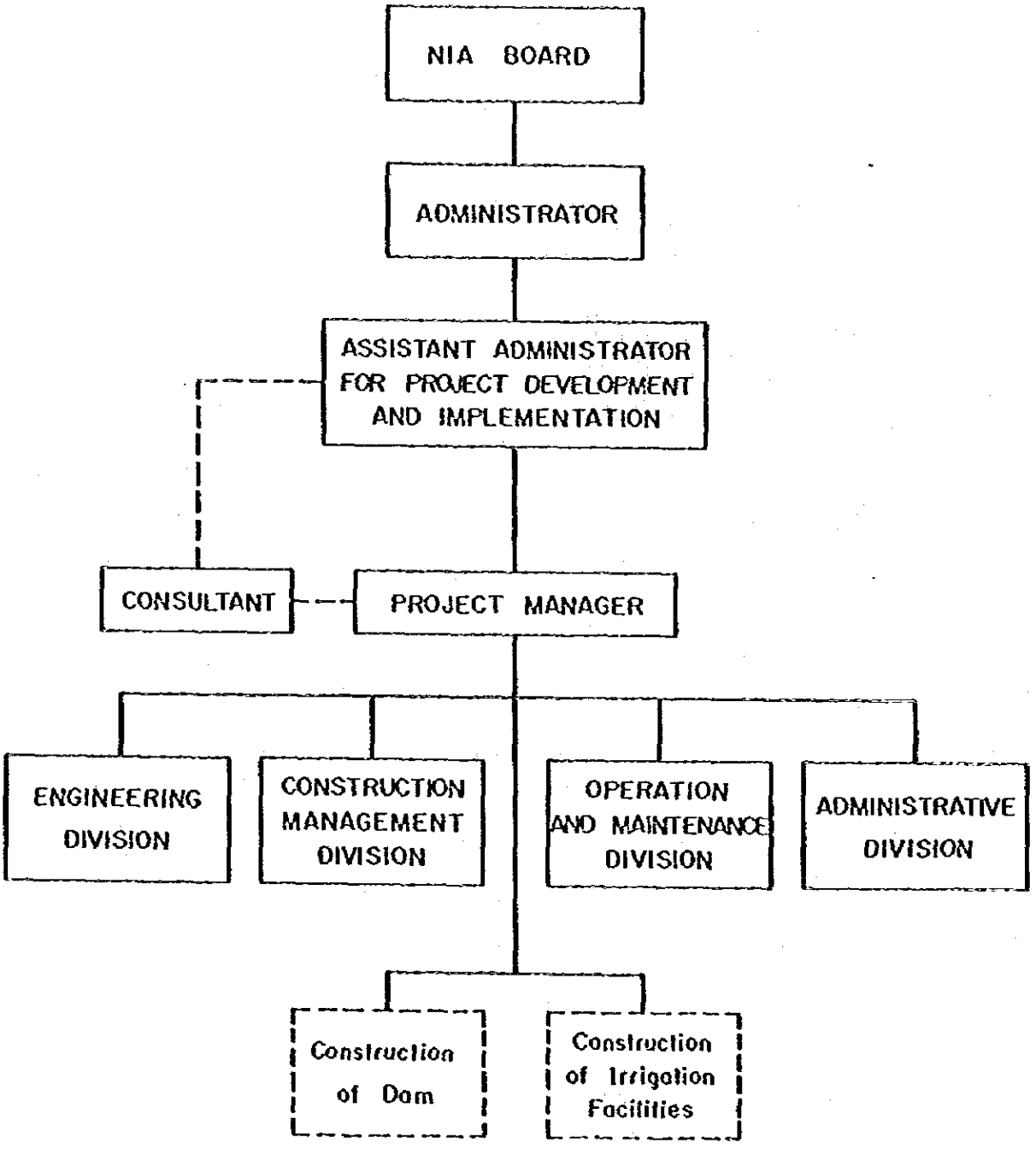
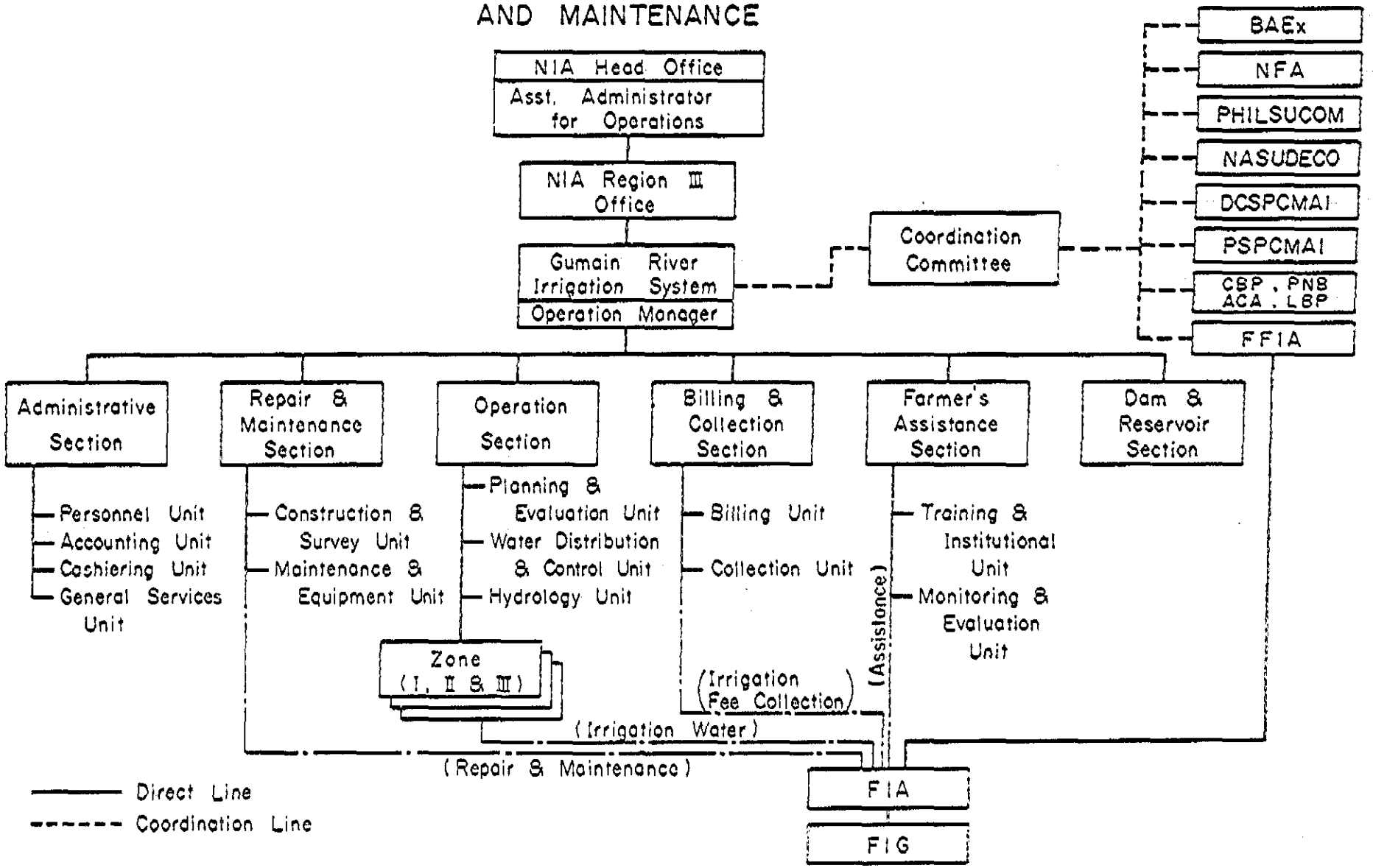


Fig. 13 PROPOSED ORGANIZATION FOR OPERATION AND MAINTENANCE



ATTACHMENT

ATTACHMENT SCOPE OF WORKS FOR STUDY ON GUMAIN RIVER IRRIGATION PROJECT

I. Objective of the Study

The objective of the study is to verify technical and economic feasibility of an irrigation project having the Gumain River as a water source, located at the southwestern part of the Pampanga River Basin in Central Luzon.

II. Scope of the Study

The Study consists of two stages. In the first stage, topographic maps of the project area, a prerequisite to the study will be prepared, and then data collection and field survey for the project formulation carried out. In the second stage, supplementary field survey, project formulation and analysis will be conducted on the basis of results of the first stage study.

III. The activities to be undertaken by JICA will be as follows:

1. First Stage

1-1(a) To conduct topographic control point survey, signalization and levelling survey necessary for the aerial photography and topographic mapping.

(b) To conduct aerial photography at the scale of 1/20,000 covering some 580 km^2 of the project area.

(c) To conduct topographic mapping of the irrigation service area of 237 km^2 at the scale of 1/4,000 with 1 m contour interval and of the reservoir area of 17 km^2 at the scale of 1/4,000 with 5 m contour interval.

(2) 1-2 To collect and review available data and information relevant to the study on the following items:

(a) Topography ;

(b) Hydro-meteorology ;

(c) Geology ;

(d) Soil ;

(e) Agriculture ;

(f) Irrigation and drainage ;

(g) Agro-economy ;

(h) Socio-economy ;

(i) Flood damage ;

(j) Power generation ;

(k) Others.

(3) 1-3 To carry out field investigations and surveys on the following items:

(a) Hydro-meteorological survey ;

(b) Geological survey ;

(c) Topographic survey ;

- Topographic survey of the Gumain Dam,
- Topographic survey of the major structures for the irrigation system;

(d) Agricultural and agro-economic survey ;

- Investigation of soils, land use and land capability,
- Present farming practices including the cropping pattern and crop yields and production etc;
- Marketing system and prices of agricultural products
- Farm economy and agricultural supporting system;

(e) Irrigation and drainage survey;

- Inventory survey on the existing irrigation, drainage and road facilities
- Delineation of the irrigation area,
- Preliminary route selection for main and secondary canals

(f) Construction material survey;

- Availability and quantities of concrete aggregates, embankment materials and other construction materials.

2. Second Stage:

(1) To carry out supplementary field survey;

(2) To carry out the following analyses and comparative studies, and formulate an optimum irrigation development plan:

(a) Land use planning;

(b) Proper crops and formulation of cropping patterns and irrigation farming practices;

(c) Irrigation and drainage requirements;

(d) Preliminary designs of the proposed dam, irrigation facilities and other structures;

(e) Most suitable construction method of the proposed dam and irrigation facilities and other structures;

(f) Organization for operation and maintenance of the project;

(g) Implementation schedule of the project;

(h) Cost and benefit of the project;

(i) Economic and financial analyses;

(j) Sensitivity tests of economic viability;

(k) and Disbursement schedule of project cost;

IV. Report

1. Inception Report

Ten (10) copies of Inception Report in English will be submitted to NIA at the commencement of the Study.

2. Field Report

Twenty (20) copies of Field Report in English will be submitted to NIA at the end of first field work in the Philippines.

3. Interim Report

Twenty (20) copies of Interim Report in English will be submitted to NIA at the end of second field work in the Philippines.

4. Draft Final Report

Twenty (20) copies of Draft Final Report in English will be submitted to NIA at the end of office work in Japan.

5. Final Report

Fifty (50) copies of Final Report in English will be submitted to NIA three months after Draft Final Report has been presented.

JICA