APPENDIX D. IRRIGATION AND DRAINAGE

APPENDIX D IRRIGATION AND DRAINAGE

Table D 1-1 Monthly Mae Kuang River Discharge and Intake Water

(Unit: MCM)

Month	1975 River Dis.	1975 Intake Water	1976 River Dis.	1976 Intake Water	1977 River Dis.	1977 Intake Water	1978 River Dis.	1978 Intake Water	1979 River Dis.	1979 Intake Water	1980 River Dis.	1980 Intake Water	Average River Dis.	Average Intake Water
Jan.	11.36	7.58	13.16	10.62	9.32	6.66	9.29	6.67	6.22	6.22	3.72	3.72	8.85	6.92
Feb.	6.38	6.38	9.22	9.22	5.40	5.40	8.44	6.90	4.62	4.62	2.23	2.23	6.05	5.79
Mar.	4.41	4.41	7.38	7.38	5.21	5.21	5.88	5.88	4.20	4.20	1.66	1.66	4.79	4.79
Apr.	3.46	3.46	6.62	6.62	6.05	6.05	5.42	5.42	3.63	3.42	2.49	2.49	4.61	3.58
May	3.59	3.41	12.44	5.26	9.20	6.66	8.58	6.89	15.75	5.65	1.62	1.62	8.53	4.92
Jun.	17.11	5.88	12.40	3.57	6.52	6.52	9.77	8.59	18.34	6.43	12.51	5.61	12.78	6.10
Jul.	42.73	11.66	8.99	8.99	15.11	11.36	59.05	13.68	11.02	8.47	19.90	5.37	26.13	9.92
Aug.	97.33	9.58	20.71	17.03	42.87	17.68	70.98	9.63	16.72	11.17	31.18	10.60	46.63	12.62
Sep.	98.68	0.70	46.31	19.57	70.77	11.16	71.13	9.39	20.15	12.40	52.96	9.32	60.00	10.42
Oct.	61.31	13.50	28.88	22.48	28.84	18.88	42.31	9.93	22.86	13.67	15.27	10.83	33.25	14.88
Nov.	37.96	4.95	18.50	8.87	15.73	6.73	18.42	5.17	7.35	6.29	12.12	2.80	18.35	5.80
Dec.	22.81	-	8.13	0.40	9.02	0.87	14.56	2.36	4.85	1.34	15.62	0.07	12.50	0
Total Wet Season1/	320.75	44.73	129.73	76.90	173.31	72.26	261.82	58.11	104.84	57.79	133.44	43.35	187.32	58.86
Dry Season2/	86.38	26.78	63.01	43.11	50.73	30.92	62.01	32.40	30.87	26.09	37.84	12.97	55.15	26.88
Year	407.13	71.51	192.74	120.01	224.04	103.18	323.83	90.51	135.71	83.88	171.28	56.32	242.47	85.74

Source: Operation and Maintenance Office of Mae Kuang Project
1/ Wet Season; May - October 2/ Dry Season; November - April

Table D 2-1 Monthly Peak Irrigation Water Requirement (Alternative-1)

Item	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Ave.	Remarks
1. Water Demand (cu.m/sec)														
1-1. Design Year 1/														
Right Bank Area	0.64	0.19	0.38	1.30	0.50	0.53	0.70	0.52	0.51	1.00	1.30	0.95		
Existing Irrigated Area High and Downstream Area	11.98	2.57	3.67	15.41	7.06	9.96	15.13	6.17	0.85	3.35	11.50	14.21		
Whole Project Area	12.61	2.92	3.48	15.61	7.55	10.48	15.76	6.14	1.36	4.34	12.81	15.16		
1-2. Normal Year 2/														
Right Bank Area	0.47	0.13	0.29	0.87	0.42	0.34	0.52	0.40	0.45	0.93	1.26	0.87	0.58	
Existing Irrigated Area High and Downstream Area	9.51	2.14	2.86	11.15	5.25	5.73	11.00	4.82	0.74	3.01	11.20	13.33	6.70	
Whole Project Area	9.98	2.28	3.16	12.01	5.67	6.07	11.52	5.22	1.19	3.94	12.60	14.26	7.28	
2. Irrigation Water Req. (ℓ/sec/ha)														
2-1. Design Year														
Right Bank Area	0.761	0.259	0.243	0.613	0.227	0.322	0.663	0.432	0.321	0.481	0.616	0.664		
Existing Irrigated Area High and Downstream Area	0.947	0.549	0.856	0.965	0.397	0.601	0.975	0.938	0.263	0.339	0.683	0.951		
Whole Project Area	0.935	0.539	0.595	0.863	0.378	0.551	0.915	0.789	0.282	0.292	0.676	0.926		
3-1. Normal Year														
Right Bank Area	0.561	0.183	0.188	0.408	0.190	0.207	0.493	0.333	0.280	0.447	0.599	0.606	0.375	
Existing Irrigated Area High and Downstream Area	0.752	0.457	0.667	0.698	0.295	0.330	0.681	0.733	0.229	0.235	0.665	0.892	0.553	
Whole Project Area	0.740	0.421	0.540	0.664	0.284	0.319	0.670	0.671	0.247	0.265	0.665	0.871	0.530	

Note; 1/ Return period of 10-year
2/ Return period of 5-year

Table D 2-2 Monthly Peak Irrigation Water Requirement (Alternative-2)

Item	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Average
1. Water Demand (cu.m/sec)													
1-1. Design Year 1/													
Right Bank Area	0.64	0.19	0.38	1.30	0.50	0.53	0.70	0.52	0.51	1.00	1.30	0.95	
Existing Irrigated Area	5.30	1.11	1.47	6.27	2.90	4.16	6.29	2.26	0.17	1.06	4.47	6.16	
High and Downstream Area	6.69	1.61	2.20	9.14	4.15	5.80	8.72	3.35	0.67	2.28	7.18	8.11	
Whole Project Area	12.61	2.92	3.48	15.61	7.55	10.48	15.75	6.14	1.36	4.34	12.81	15.16	
1-2. Normal Year 2/													
Right Bank Area	0.47	0.13	0.29	0.87	0.42	0.34	0.52	0.40	0.45	0.93	1.26	0.87	0.58
Existing Irrigated Area	4.20	0.88	1.15	4.56	2.14	2.38	4.61	1.96	0.15	0.94	4.35	5.79	2.75
High and Downstream Area	5.31	1.27	1.72	6.58	3.11	3.35	6.39	2.86	0.59	2.07	6.99	7.60	3.97
Whole Project	9.98	2.28	3.16	12.01	5.67	6.07	11.52	5.22	1.19	3.94	12.60	14.26	7.28
2. Irrigation Water Req. (ℓ/sec/ha)													
2-1. Design Year													
Right Bank Area	0.761	0.259	0.243	0.613	0.227	0.322	0.663	0.432	0.321	0.481	0.616	0.664	
Existing Irrigated Area	0.942	0.593	1.105	1.006	0.414	0.594	0.943	0.922	0.245	0.222	0.674	0.980	
High and Downstream Area	0.952	0.573	0.744	0.938	0.384	0.560	0.920	0.812	0.265	0.284	0.704	0.936	
Whole Project Area	0.935	0.539	0.595	0.863	0.378	0.551	0.915	0.789	0.282	0.292	0.676	0.926	
2-2. Normal Year													
Right Bank Area	0.561	0.183	0.188	0.408	0.190	0.207	0.493	0.333	0.280	0.447	0.599	0.606	0.375
Existing Irrigated Area	0.725	0.469	0.862	0.732	0.306	0.340	0.691	0.800	0.216	0.197	0.655	0.921	0.575
High and Downstream Area	0.756	0.451	0.580	0.676	0.287	0.323	0.674	0.692	0.234	0.259	0.686	0.878	0.541
Whole Project Area	0.740	0.421	0.540	0.664	0.284	0.319	0.670	0.671	0.247	0.265	0.665	0.871	0.530

Note. 1/ return period of 10-year.
2/ return period of 2-year

Table D 2-3 Monthly Peak Irrigation Water Requirement (Alternative-3)

Item	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Ave.	Remarks
1. Water Demand (cu.m/sec)														
1-1. Design Year														
Right Bank Area	0.64	0.19	0.38	1.30	0.50	0.53	0.70	0.52	0.51	1.00	1.30	0.95		
Existing Irrigated Area	9.48	2.06	2.92	12.31	5.65	7.99	12.05	4.48	0.62	2.58	9.08	11.48		
High and Downstream Area	2.36	0.51	0.74	3.10	1.41	1.97	2.86	1.14	0.23	0.78	2.42	2.72		
Whole Project Area	12.61	2.92	3.48	15.61	7.55	10.48	15.75	6.14	1.36	4.34	12.81	15.16		
1-2. Normal Year														
Right Bank Area	0.47	0.13	0.29	0.87	0.42	0.34	0.52	0.40	0.45	0.93	1.26	0.87	0.58	
Existing Irrigated Area	7.73	1.72	2.28	8.92	4.20	4.59	8.83	3.89	0.54	2.31	8.84	10.78	5.38	
High and Downstream Area	1.78	0.42	0.58	2.23	1.05	1.14	2.17	0.97	0.20	0.71	2.36	2.55	1.34	
Whole Project Area	9.98	2.28	3.16	12.01	5.67	6.07	11.52	5.22	1.19	3.94	12.60	14.26	7.28	
2. Irrigation Water Req. (ℓ/sec/ha)														
2-1. Design Year														
Right Bank Area	0.761	0.259	0.243	0.613	0.227	0.322	0.663	0.432	0.321	0.481	0.616	0.664		
Existing Irrigated Area	0.921	0.550	0.885	0.970	0.399	0.577	0.932	0.865	0.263	0.256	0.678	0.955		
High and Downstream Area	1.003	0.545	0.748	0.942	0.386	0.561	0.889	0.814	0.265	0.287	0.702	0.935		
Whole Project Area	0.935	0.539	0.595	0.863	0.378	0.551	0.915	0.789	0.282	0.292	0.676	0.926		
3-1. Normal Year														
Right Bank Area	0.561	0.183	0.188	0.408	0.190	0.207	0.493	0.333	0.280	0.447	0.599	0.606	0.375	
Existing Irrigated Area	0.751	0.459	0.691	0.703	0.297	0.331	0.683	0.751	0.229	0.229	0.660	0.896	0.557	
High and Downstream Area	0.756	0.449	0.587	0.678	0.287	0.325	0.675	0.692	0.231	0.261	0.683	0.876	0.542	
Whole Project Area	0.740	0.421	0.540	0.664	0.284	0.319	0.670	0.671	0.247	0.265	0.665	0.871	0.530	

Table D 2-4 Monthly Cropping Area (Alternative-1)

Crops	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
A. Right Bank Area												
1. Rice-Soybean + Groundnuts	2,940	750	855	4,005	4,500	4,500	4,289	1,575	60	2,250	3,000	3,000
2. Tobacco									125	500	445	15
3. Garlic + Vegetable									500	1,000	1,000	500
4. Soybeans		1,526	6,591	6,938	6,938	3,469						
5. Tobacco								516	1,563	1,563	1,047	
6. Groundnuts								3,118	5,375	5,375	5,375	3,118
7. Longan	2,313	2,313	2,313	2,313	2,313	2,313	2,313	2,313	2,313	2,313	2,313	2,313
Sub-total	5,253	4,589	9,759	13,256	13,751	10,282	6,602	7,522	9,936	13,001	13,180	8,946
B. Existing Irrigated Area and Hihg & Downstream Areas												
1. Rice - Rice	15,624	10,469	19,746	92,502	103,935	103,936	99,051	36,377			10,469	15,623
2. Soybeans + Groundnuts	61,556	15,703							1,256	47,108	62,813	62,813
3. Tobacco									1,156	4,625	4,116	139
4. Corn									6,750	13,500	13,500	6,750
5. Garlic + Vegetable									3,688	7,375	7,375	3,688
6. Soybeans		1,196	5,166	5,438	5,438	2,719						
7. Groundnuts								2,465	4,250	4,250	4,250	2,465
8. Tobacco								392	1,188	1,188	796	
9. Longan	1,875	1,875	1,875	1,875	1,875	1,875	1,875	1,875	1,875	1,875	1,875	1,875
Sub-total	79,055	29,243	26,787	99,815	111,248	108,530	100,926	41,109	20,163	79,921	105,194	93,353
Total (rai)	84,308	33,832	36,546	113,071	124,999	118,812	107,528	48,631	30,099	92,922	118,374	102,299
(ha)	13,489	5,413	5,847	18,091	20,000	19,010	17,204	7,781	4,816	14,867	18,940	16,368

Table D 2-5 Monthly Cropping Area (Alternative-2)

Crops	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
A. Right Bank Area												
1. Rice - Soybean + Groundnuts	2,940	750	855	4,005	4,500	4,500	4,289	1,575	60	2,250	3,000	3,000
2. Tobacco									125	500	445	15
3. Garlic + Vegetable									500	1,000	1,000	500
4. Soybeans		1,526	6,591	6,938	6,938	3,469						
5. Tobacco								516	1,563	1,563	1,047	
6. Groundnuts								3,118	5,375	5,375	5,375	3,118
7. Longan	2,313	2,313	2,313	2,313	2,313	2,313	2,313	2,313	2,313	2,313	2,313	2,313
Sub-total	5,253	4,589	9,759	13,256	13,751	10,282	6,602	7,522	9,936	13,001	13,180	8,946
B. Existing Irrigated Area												
1. Rice - Rice	6,563	4,397	8,313	38,938	43,750	43,750	41,694	15,313			4,397	6,563
2. Soybeans + Groundnuts	28,604	7,297							584	21,891	29,188	29,188
3. Tobacco									250	1,000	890	30
4. Corn									1,906	3,813	3,813	1,906
5. Garlic + Vegetable									1,594	3,188	3,188	1,594
Sub-total	35,167	11,694	8,313	38,938	43,750	43,750	41,694	15,313	4,334	29,892	41,476	39,281
C. High and Downsrream Area												
1. Rice - Rice	9,060	6,072	11,433	53,564	60,185	60,186	57,357	21,064			6,072	9,063
2. Soybeans + Groundnuts	32,953	8,406							669	25,214	33,623	33,622
3. Tobacco									906	3,626	3,226	109
4. Corn									4,844	9,688	9,688	4,844
5. Garlic + Vegetable									2,094	4,188	4,188	2,094
6. Soybeans		1,196	5,166	5,438	5,438	2,719						
7. Groundnuts								2,465	4,250	4,250	4,250	2,465
8. Tobacco								392	1,188	1,188	796	
9. Longan	1,875	1,875	1,875	1,875	1,875	1,875	1,875	1,875	1,875	1,875	1,875	1,875
Sub-total	43,888	17,549	18,474	60,877	67,498	64,780	59,232	25,796	15,826	50,029	63,718	54,072
Total (rai)	84,308	33,832	36,546	113,071	124,999	118,812	107,528	48,631	30,099	92,922	118,374	102,299
(ha)	13,489	5,413	5,847	18,091	20,000	19,010	17,204	7,781	4,816	14,867	18,940	16,368

Table D 2-6 Monthly Cropping Area (Alternative-3)

Crops	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
A. Right Bank Area												
1. Rice - Soybean + Groundnuts	2,940	750	855	4,005	4,500	4,500	4,289	1,575	60	2,250	3,000	3,000
2. Tobacco									125	500	445	15
3. Garlic + Vegetable									500	1,000	1,000	500
4. Soybeans		1,526	6,591	6,938	6,938	3,469						
5. Tobacco								516	1,563	1,563	1,047	
6. Groundnuts								3,118	5,375	5,375	5,375	3,118
7. Longan	2,313	2,313	2,313	2,313	2,313	2,313	2,313	2,313	2,313	2,313	2,313	2,313
Sub-total	5,253	4,589	9,759	13,256	13,751	10,282	6,602	7,522	9,936	13,001	13,180	8,946
B. Existing Irrigated Area												
1. Rice - Rice	12,625	8,459	15,865	74,315	83,500	83,500	79,576	28,225			8,459	12,625
2. Soybeans + Groundnuts	50,470	12,875							1,030	38,625	51,500	51,500
3. Tobacco									844	3,375	3,004	101
4. Corn									5,093	10,188	10,188	5,093
5. Garlic + Vegetable									2,969	5,938	5,938	2,969
6. Soybeans		811	3,503	3,688	3,688	1,844						
7. Groundnuts								1,631	2,812	2,812	2,812	1,631
8. Tobacco								248	750	750	503	
9. Longan	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250
Sub-total	64,345	23,395	20,618	79,253	88,438	86,594	80,826	32,354	14,748	62,938	83,654	75,169
C. High and Downstream Area												
1. Rice - Rice	3,000	2,010	2,887	18,187	20,435	20,436	19,475	7,153			2,010	3,000
2. Soybeans + Groundnuts	11,085	2,828							226	8,481	11,310	11,313
3. Tobacco									313	1,250	1,113	38
4. Corn									1,656	3,313	3,313	1,656
5. Garlic + Vegetable									719	1,438	1,438	719
6. Soybeans		385	1,663	1,750	1,750	875						
7. Groundnuts								833	1,438	1,438	1,438	833
8. Tobacco								144	438	438	293	
9. Longan	625	625	625	625	625	625	625	625	625	625	625	625
Sub-total	14,710	5,848	6,175	20,562	22,810	21,936	20,100	8,755	5,415	16,983	21,540	18,184
Total (rai)	84,308	33,832	36,546	113,071	124,999	118,812	107,528	48,631	30,099	92,922	118,374	102,299
(ha)	13,489	5,413	5,847	18,091	20,000	19,010	17,204	7,781	4,816	14,867	18,940	16,368

Estimation of Irrigation Water Requirement

In order to study an optimum reservoir capacity of the Mae Kuang reservoir, the irrigation water requirement in case of several alternative cropping pattern, which will be described hereinafter, has been estimated during the period of the First Stage survey (15th February to 31st March 1981) of the Project. In this stage, the Project Area is decided at 25,600 ha (160,000 rai), through the preliminary survey of the area.

The subsequent paragraph deads with descriptions of the estimation of irrigation water requirement under these conditions.

a) Tentative Cropping Pattern

Cropping Pattern

Following two alternative cropping patterns have been basically proposed tentatively in this stage, based on the collected data and field survey for present crop cultivation (See Figure D 3-1).

Alternative-1

Wet Season Dry Season

Rice + Rice ------------------------ 30%

Rice + Tobacco + Melon ------------- 20%

Rice + Upland Crops ---------------- 35%

Fruit and Vegetable (year round)---- 15%

Alternative-2

Rice + Tobacco + Melon ------------- 20%

Rice + Upland Crops ---------------- 65%

Fruit and Vegetable (year round) --- 15%

Both cropping patterns mentioned above show 200 percent of cropping intensity, however, taking into account the shortage of waters for second crops such as tobacco, melon, upland crops and etc. the cropping pattern with low cropping intensity during the dry season has been planned as alternatives, as shown below:

	Cropping Intensity (%)
Alternative 1-1	100
1-2	80
1-3	75
1-4	70
1-5	60
1-6	55
1-7	50
Alternative 2-1	100
2-2	90
2-3	80
2-4	75
2-5	70

b) Irrigation Water Requirement

1) Potential Evapotranspiration

The reference crop potential evapotranspiration (ETPc) has been estimated by applying the modified Penman method, based on the climateological data observed at Chiang Mai station. The following table gives the result of the estimated ETPc for the project.

Potential Evapotranspiration

(Unit: mm/month)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Total
ETPc	105	134	158	168	171	138	136	119	121	125	110	95	1,580

2) Consumptive Use

The consumptive use of crops (actual evapotranspiration, ETa) can be estimated by multiplying the estimated ETPc values by crop coefficients.

The following table gives the consumptive use of crops estimated by the above procedure on the daily basis.

Estimated Consumptive Use

(Unit: mm)

Month	Paddy Wet Season (HYV)	Paddy Dry Season (HYV)	Tobacco	Melon	Upland Crop	Vegetable/ Orchard
Jan.		3.38	1.35		1.01	2.37
Feb.		4.94	3.36		2.40	3.36
Mar.		6.52	5.09		5.09	3.56
Apr.		7.07	5.05	1.68	4.49	3.93
May		5.53		2.21		3.87
Jun.				3.90		3.21
Jul.				3.06		3.06
Aug.	3.97					2.70
Sep.	4.57					2.83
Oct.	4.89					2.83
Nov.	3.68					2.58
Dec.						2.14
Average	4.28	5.49	3.71	2.71	3.25	3.04

3) Crop Water Requirement

Crop water requirement on the monthly basis is estimated based on the proposed cropping pattern. In this estimation, the following values are accounted:

- Percolation rate in the Paddy fields: 1.5 mm/day
- Additional water supply for land soaking for nursery bed and land preparation:

Item	Wet Season Rice (mm)	Dry Season Rice (mm)
Nursery bed	400	450
Land preparation	200	230

The estimated crop water requirement for each crop is shown as follow:

Rice, Wet season rice:		827 mm
Dry season rice:		1,036 mm
Tobacco	:	395
Melon	:	282
Upland	:	391
Fruit and Vegetable	:	1,093

4) Diversion Water Requirement

Diversion water requirement will be calculated by adding effective rainfall and water losses to the crop water requirement.

The criteria of the effective rainfall and irrigation efficiency used for the estimation are as follows:

Effective Rainfall

Rainfall (R) (mm)	Effective Rainfall (ER)
0 - 10	0
11 - 100	R x 0.80
101 - 200	R x 0.70
201 - 250	R x 0.60
251 - 300	R x 0.55
301 - up	R x 0.50

Note: One of the method used for RID Projects.

Irrigation Efficiency

Application efficiency:	0.80
Canal efficiency :	0.81
- Conveyance losses :	0.10
- Operation losses :	0.10

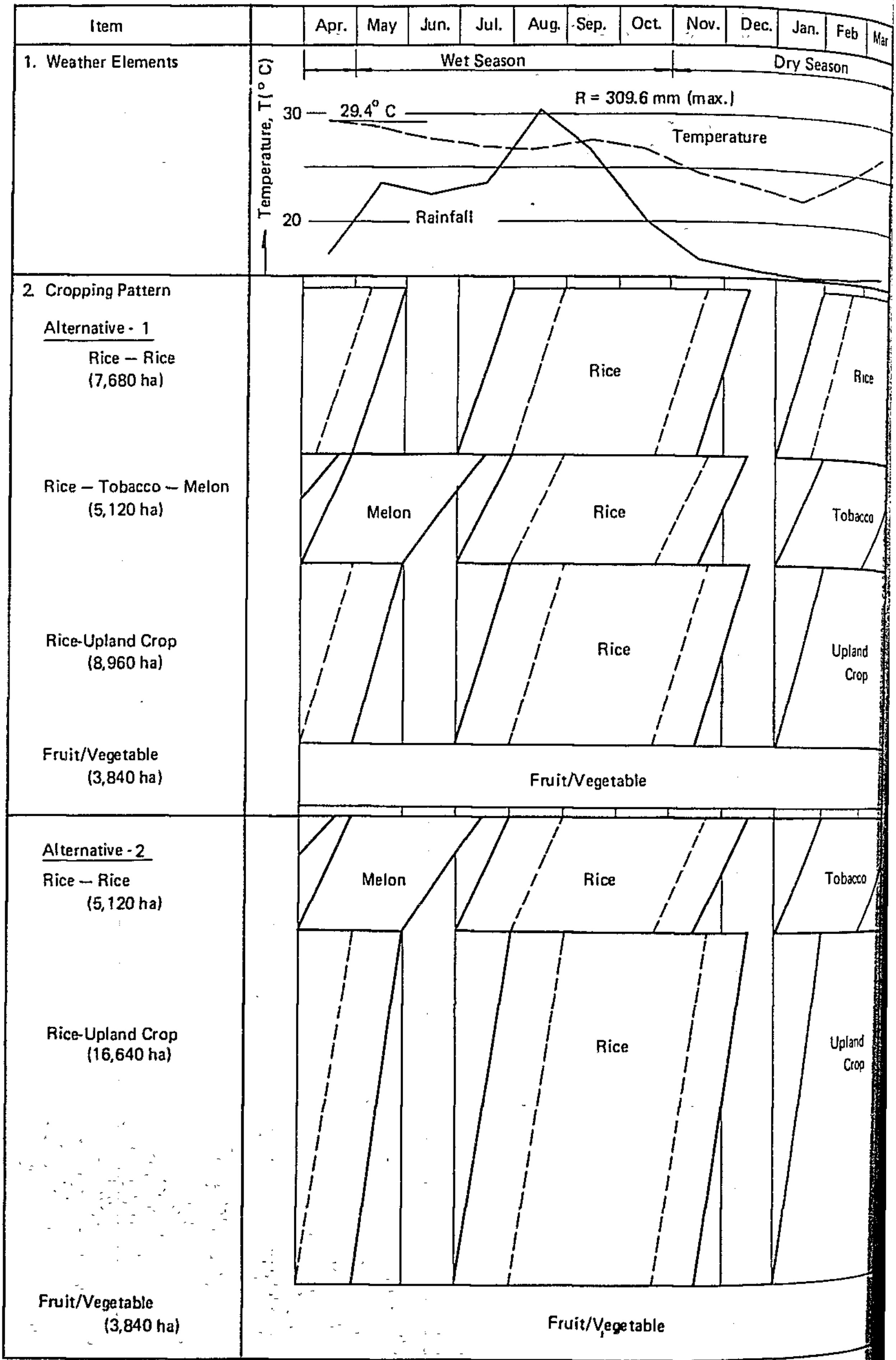
Table D 3-1 indicates the estimated annual diversion water requirement in each alternative cropping pattern.

Table D 3-1 Average Irrigation Water Requirements (1952 - 1979)

(Unit: MCM)

Alternative	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual	
Alternative-1														
1-1 (100)	35.99	4.07	3.81	22.92	23.76	20.26	41.30	18.62	3.88	28.91	52.03	63.57	319.12	
1-2 (80)	28.79	3.25	3.05	22.88	23.76	20.26	41.30	18.62	3.88	23.13	41.62	50.86	281.41	
1-3 (75)	26.99	3.05	2.86	22.88	23.76	20.26	41.30	18.62	3.88	21.68	39.02	47.68	271.98	
1-4 (70)	25.19	2.85	2.67	22.87	23.76	20.26	41.30	18.62	3.88	20.24	36.42	44.50	262.56	
1-5 (60)	21.59	2.44	2.28	22.85	23.76	20.26	41.30	18.62	3.88	17.35	31.22	38.14	243.69	
1-6 (55)	19.79	2.24	2.09	22.84	23.76	20.26	41.30	18.62	3.88	15.90	28.62	34.96	234.27	
1-7 (50)	17.99	2.03	1.90	22.83	23.76	20.26	41.30	18.62	3.88	14.45	26.02	31.78	224.85	
Alternative-2														
2-1 (100)	21.17	4.20	3.84	23.19	23.75	20.42	41.21	19.21	3.47	9.00	29.16	52.36	250.97	
2-2 (90)	19.05	3.78	3.46	23.17	23.75	20.42	41.21	19.21	3.47	8.10	26.24	47.13	238.98	
2-3 (80)	16.93	3.36	3.07	23.16	23.75	20.42	41.21	19.21	3.47	7.20	23.33	41.89	226.99	(proposed
2-4 (75)	15.88	3.15	2.88	23.15	23.75	20.42	41.21	19.21	3.47	6.75	21.87	39.27	221.00	
2-5 (70)	14.82	2.94	2.69	23.14	23.75	20.42	41.21	19.21	3.47	6.30	20.41	36.65	215.00	

FIGURE 3-1. ALTERNATIVE CROPPING PATTERN (100% FOR BOTH SEASONS)



Estimation of Reference Crop Potential Evapotranspiration (ETPc)

Modified Penman Method[1/]

Penman has made the most complete theoretical approach, showing that consumptive use is inseparably connected to incoming solar energy.

His formula representing the potential evapo-transpiration (consumptive use) is as follows in the modified form:

$$Etp = \frac{\Delta}{\Delta + \gamma} (Rn + G) + \frac{\gamma}{\Delta + \gamma} 15.36 (w_1 + w_2 u_2) (es - ea) \qquad (7.1)$$

where Etp = reference crop potential evapo-transpiration, well-watered alfalfa in cal/cm^2 per day (langleys/day)

Δ = slope of saturation vapor pressure-temperature curve (de/dT) in mbar/°C

γ = psychrometric constant

Rn = net radiation in cal/cm^2 per day

G = soil heat flux in cal/cm^2 per day

u_2 = wind movement in km/day at 2 m

es = saturation vapor pressure, mean of values obtained at daily maximum and daily minimum temperatures in mbar (This is a modification of the original Penman equation.)

ea = mean actual vapor pressure in mbar

w_1, w_2 = wind term coefficients, some empirically determined values are:

w_1	w_2	Location	Reference Crop
1.10	0.0106	Mitchell, Nebraska	alfalfa
0.75	0.0115	Kimberly, Ibaho	alfalfa
1.00	0.0062	Penman	short grass

$$\gamma = cp \frac{P}{(0.622\lambda)} \qquad (7.2)$$

where cp = 0.240

P = 1013 - 0.1055 EL, mbar, (EL is elevation in meters) (7.3)

λ = latent heat of water in cal/g; estimated by $\lambda = 595.9 - 0.55\ T$, T in °C (7.4)

1/ quoted from the Book of "Irrigation Principals and Practices" written by O.W. Israelsen and V.E. Hansen

$$\Delta = 33.86\ [0.05904\ (0.00738T + 0.8072)^7 - 0.0000342] \quad (7.5)$$
for $T \geq 23°C$, Δ in mbar/°C

$$Rn = 0.77\ Rs - Rb \quad (7.6)$$

where Rs = incident solar radiation in cal/cm^2 per day.

The 0.77 value is obtained by assuming a reflectivity of 0.23 for a green growing crop.

$$Rb = Rbo\ [(aRs/Rso) + b] \quad (7.7)$$

where Rso = clear day solar radiation in langleys/day. If actual records are not available, Rso values may be estimated from Table D 4-5.

a,b = empirical constants, see table following equation 7.8.

$$Rbo = (a_1 + b_1\ \sqrt{ea})\ 11.71 \times 10^{-8}(Ta^4 + Tb^4)/2 \quad (7.8)$$

where a_1, b_1 = empirical constants, see following table

ea = mean actual vapor pressure in mbar

Ta = maximum daily temperature in °K

Tb = minimum daily temperature in °K

Values of a, b, a_1 and b_1 have been determined for various locations as:

a	b	a_1	b_1	Location
0.90	0.10	0.37	-0.044	Mitchell, Nebraska1/
1.35	-0.35	0.35	-0.046	Davis, California
1.22	-0.18	0.33	-0.044	Kimberly, Idaho
1.20	-0.20			Arid regions (suggested)
1.10	-0.10			Semihumid (suggested)
1.00	0.00			humid (suggested)
		0.39	-0.05	general

1/ The reported w_1, w_2, a, b, a_1, and b_1, valued for Mitchell, Neb. are adapted from Scheduling Irrigations Using a Programmable Calculator, D. C. Kincaid and D. F. Heerman, U.S.D.A., ARS-NC-12, February 1974. Reported values for other locations are adapted from the A.S.C.E. report.

An empirical equation for estimating the soil heat flux is:

$$G = [\overline{T}pr - \overline{T}]\ 9.1 \qquad (7.9)$$

where $\overline{T}pr$ = mean air temperature for a previous time period, usually the previous three days when daily estimates of Etp are required

$\overline{T}$ = mean air temperature for the current time period, ie mean air temperature of the particular day for which Etp is required.

Estimation of ETPc

Reference crop potential evapotranspiration (ETPc) is estimated by applying the above mentioned method, based upon the observed meteorological data at Chiang Mai, and the results are tabulated in Table D 4-1. Table D 4-2 shows an actual procedure for the estimation.

Table D 4-1 Estimated Referance Crop Potential Evapotranspiration

Station: Chiang Mai (Elevation: 300m MSL, Latitude: N 18°45')

	U_2 (km/day)	Rso (langleys/day)	Rs (cal/cm²/day)	es (mbar)	ea (mbar)	$\overline{T}$ (°C)	Tmax (°C)	Tmin (°C)	ETPc (mm/day)	ETPc (mm/month)
Jan.	56.4	511	410	27.6	16.6	20.0	29.0	13.0	3.38	105
Feb.	71.3	644	501	31.9	16.2	22.2	32.1	13.8	4.80	134
Mar.	86.2	657	461	37.8	17.6	25.6	34.9	17.2	5.09	158
Apr.	107.0	718	478	42.6	22.1	28.3	36.2	21.1	5.61	168
May	104.0	721	519	41.0	26.4	28.0	34.1	23.2	5.53	171
Jun.	91.9	753	448	38.6	28.6	27.1	32.2	23.6	4.59	138
Jul.	80.2	723	440	37.3	27.8	26.7	31.4	23.3	4.37	136
Aug.	71.3	694	397	36.3	28.1	26.2	30.7	23.2	3.85	119
Sep.	71.3	684	419	36.4	27.8	26.2	31.0	22.8	4.04	121
Oct.	65.3	604	443	35.3	26.3	25.5	30.9	21.6	4.04	125
Nov.	53.3	548	436	31.7	22.4	23.4	29.8	18.6	3.68	110
Dec.	50.4	485	380	27.9	18.1	20.6	28.5	14.7	3.05	95

U_2: Table D 4-3
Rso: Table D 4-4
Rs: Monthly mean solar radiation at Chiang Mai
es, ea: Table D 4-6
$\overline{T}$, Tmax, Tmin: Monthly mean, mean maximum and mean minimum temperatures at Chiang Mai

Table D 4-2 Procedure for the Estimation of ETPc (January)

Example, (Chiang Mai, Lat. 18°45', EL 300m MSL)

A. Data, January

1. Air temperature
   - mean maximum, Tmax (°C) 29.0
   - mean minimum, Tmin (°C) 13.0
2. Average dewpoint °C 14.6
3. Average wind movement, U_2 (km/day) 54.6
4. Average clear day solar radiation, Rso 511 (langleys/day)
5. Average solar radiation, Rs 410 (langleys/day)

B. Modified Penman Equation

$\gamma = Cp\ P/(0.622\lambda)$	Eq.7.2	
1. Cp		0.24
2. $P = 1013 - 0.1055\ EL$	Eq.7.3	981
3. $\lambda = 595.9 - 0.55\ T(mean)$	Eq.7.4	584
4. $1/(0.622\lambda)$		0.00275
5. $\gamma = Cp \cdot P/(0.622\lambda)$	Eq.7.3	0.647
$Rbo = (a_1+b_1\sqrt{ea})11.71\times10^{-8}(Ta^4+Tb^4)/2$	Eq.7.8	
6. Ta = °C + 273°C, °K(mean max.)		302
7. Tb = °C + 273°C, °K(mean min.)		286
8. a_1		0.39
9. b_1		-0.05
10. ea (at dew point) (mbar)		16.6
11. $Rbo = (a_1+b_1\sqrt{ea})11.71\times10^{-8}(Ta^4+Tb^4)/2$	Eq.7.8	164
12. a		1.00
13. b		0.00

14.	$Rb = Rbo[(aRs/Rso)+b]$	Eq.7.7	132
15.	$Rn = 0.77Rs - Rb$	Eq.7.6	184
	$G = (\overline{T}pr - \overline{T}) \times 9.1$	Eq.7.9	
16.	Assume G = 0		
	$\Delta = 33.86[0.05904(0.00738T+0.8072)^7-0.0000342]$	Eq.7.5	
17.	Δ	Eq.7.5	1.53
	$Ept = \frac{\Delta}{\Delta+\gamma}(Rn+G) + \frac{\gamma}{\Delta+\gamma} 15.36(w_1+w_2 \cdot u_2)(es-ea)$		
18.	$\frac{\Delta}{\Delta+\gamma}(Rn + G)$		129
19.	$\gamma/(\Delta+\gamma)$		0.297
20.	w_1		1.00
21.	w_2		0.0062
22.	$15.38\ (w_1 + w_2u_2)$		20.6
23.	es (mbar)		27.6
24.	(es - ea) (mbar)		11.0
25.	Etp		196
26.	Kco		1.01
27.	Et crop (langleys/day)		198
28.	Et crop x $10/\lambda$ (mm/day)		3.38
29.	" (mm/month)		105

Table D 4-3 Wind Velocity

	U_{15}: Mean Velocity at 15m (km/hr)	U_2: Mean Velocity[1/] at 2m (km/hr)	Mean Velocity at 2m km/day	m/sec
Jan.	3.52	2.35	56.4	0.653
Feb.	4.44	2.97	71.3	0.825
Mar.	5.37	3.59	86.2	0.997
Apr.	6.66	4.45	107.0	1.24
May	6.48	4.33	104.0	1.20
Jun.	5.74	3.83	91.9	1.06
Jul.	5.00	3.34	80.2	0.928
Aug.	4.44	2.97	71.3	0.825
Sep.	4.44	2.97	71.3	0.825
Oct.	4.07	2.72	65.3	0.756
Nov.	3.33	2.22	53.3	0.617
Dec.	3.15	2.10	50.4	0.583

Note: 1/ Converted to mean velocity at 2m above ground from 15m with the following equation.

$$u_2 = u_{15}\left(\frac{2}{H}\right)^{0.2} = u_{15}\left(\frac{2}{15}\right)^{0.2} = 0.668\ u_{15}$$

Table D 4-4 Clear Day Solar Radiation

Latitude: 18°45' (Unit: langleys/day)

	R_{15} (N15°)	R_{20} (N20°)	Rs_0[2/] (N18°45')		R_{15} (N15°)	R_{20} (N20°)	Rs_0[2/] (N18°45')
Jan.	545	500	511	Jul.	706	729	723
Feb.	673	634	644	Aug.	684	697	694
Mar.	671	652	657	Sep.	697	680	684
Apr.	713	720	718	Oct.	623	597	604
May	706	726	721	Nov.	580	537	548
Jun.	733	760	753	Dec.	519	474	485

Note: 2/ R_{15} and R_{20} are referred to Table D 4-5.

$$C = 18 + \frac{45}{60} = 18.75$$

$$Rso = \frac{(18.75 - 15)}{5} \times (R_{20} - R_{15}) + R_{15}$$

$$= 0.75\ (R_{20} - R_{15}) + R_{15}$$

Table D 4-5 Total Daily Solar Radiation at the Top of the Atmosphare

(Unit: langlays/day)

Latitude °N	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
60	58	152	319	533	671	763	690	539	377	197	87	35
55	100	219	377	558	690	780	706	577	430	252	133	74
50	155	290	429	617	716	790	729	616	480	313	193	126
45	216	365	477	650	729	797	748	648	527	371	260	190
40	284	432	529	677	742	800	755	674	567	426	323	248
35	345	496	568	700	742	800	761	697	603	474	380	313
30	403	549	600	713	742	793	755	703	637	519	437	371
25	455	595	629	720	742	780	745	703	660	561	486	423
20	500	634	652	720	726	760	729	697	680	597	537	474
15	545	673	671	713	706	733	706	684	697	623	580	519
10	584	701	681	707	684	700	681	665	707	648	617	565
5	623	722	690	700	652	663	645	645	710	665	650	606
0	652	740	694	680	623	627	616	623	707	684	680	619
-5	648	758	690	663	590	587	577	590	693	690	727	677
-10	710	772	681	640	571	543	526	558	680	690	727	710
-15	729	779	665	610	516	497	497	519	657	687	747	739
-20	748	779	645	573	474	447	445	481	630	677	753	761
-25	761	779	626	533	419	400	406	439	600	665	767	777
-30	771	772	600	497	384	353	358	390	567	648	767	793
-35	774	754	568	453	335	300	310	342	530	629	767	806
-40	774	729	529	407	281	243	261	290	477	603	760	813
-45	774	704	490	357	229	183	203	235	447	571	747	813
-50	761	669	445	307	174	127	148	177	400	535	727	806
-55	748	630	397	250	123	77	97	123	343	497	707	794
-60	729	588	348	187	77	33	52	74	283	455	700	787

Table D 4-6 Vapor Pressure

	ea: Mean Actual vapor Pressure		es: mean of values obtained at daily maximum and daily minimum temperatures in mbar					
	Dew Point (°C)	ea (mbar)	Max. Tem. (°C)	Min. Tem. (°C)	emax (mbar)	emin (mbar)	$es = \frac{emax + emin}{2}$ (mbar)	(es - ea) (mbar)
Jan.	14.6	16.6	29.0	13.0	40.1	15.0	27.6	11.0
Feb.	14.1	16.2	32.1	13.8	47.9	15.9	31.9	15.7
Mar.	15.5	17.6	34.9	17.2	55.9	19.6	37.8	20.2
Apr.	19.1	22.1	36.2	21.1	60.0	25.1	42.6	20.5
May	22.0	26.4	34.1	23.2	53.5	28.4	41.0	14.6
Jun.	23.3	28.6	32.2	23.6	48.1	29.1	38.6	10.0
Jul.	22.8	27.8	31.4	23.3	46.0	28.6	37.3	9.5
Aug.	23.0	28.1	30.7	23.2	44.2	28.4	36.3	8.2
Sep.	22.8	27.8	31.0	22.8	44.9	27.9	36.4	8.6
Oct	21.9	26.3	30.9	21.6	44.7	25.8	35.3	9.0
Nov.	19.3	22.4	29.8	18.6	41.9	21.4	31.7	9.3
Dec.	15.9	18.1	28.5	14.7	39.0	16.7	27.9	9.8

Note: ea, emax, emin are computed with using Table D 4-7.

Table D 4-7 Saturation Vapor Pressure

(Unit: mbar)

Temperature (°C)	Saturation Vapour Pressure (mbar)	Temperature (°C)	Saturation Vapur Pressure (mbar)
0	6.1	20	23.4
1	6.6	21	24.9
2	7.1	22	26.4
3	7.6	23	28.1
4	8.1	24	29.8
5	8.7	25	31.7
6	9.3	26	33.6
7	10.0	27	35.7
8	10.7	28	37.8
9	11.5	29	40.1
10	12.3	30	42.4
11	13.1	31	44.9
12	14.0	32	47.6
13	15.0	33	50.3
14	16.1	34	53.2
15	17.0	35	56.2
16	18.2	36	59.4
17	19.4	37	62.8
18	20.6	38	66.3
19	22.0	39	69.9

Measurements of Percolation Rate

The measurements of percolation rate have been made at 11 sites in the existing paddy fields by means of portable measuring equipments. The location of the measuring sites are given in Figure D 5-1. and the following table shows the results of them.

Results of Percolation Tests

No.	Location	Rate (mm/day)	Soil Texture
1.	Ban Phae	3.4	Coarse textured soil
2.	Ban Luang Nua	0.2	- do -
3.	Ban Phayak Luang	1.8	Medium textured soil
4.	Ban Mae Ka Nua	2.4	- do -
5.	Ban Nam Cham	0.2	- do -
6.	Ban Bo Sang	3.1	Coarse textured soil
7.	Ban Tha Ton Kwao	0.8	Fine textured soil
8.	Ban Huai Sai Thai	0.5	Coarse textured soil
9.	Ban Cheng Pham	1.3	Medium textured soil
10.	Ban Rim Pong	2.8	Coarse textured soil
11.	Ban San Pa Fai	0.8	Medium textured soil

Note: Areas of each soil texture are as follows;

Coarse textured soil:	8,220 ha	(40.0%)
Medium textured soil:	10,370	(50.5%)
Fine textured soil:	1,950	(9.5%)
Total	20,540	(100.0%)

An average percolation rate for the whole Project Area is estimated at 1.53 mm/day in this stage, by using the proportion of soil texture distribution as shown below;

Coarse textured soil:	2.00 mm/day x 40%
Medium textured soil:	1.30 mm/day x 50.5%
Fine textured soil:	0.80 mm/day x 9.5%

Weighted average rate = 1.53 mm/day

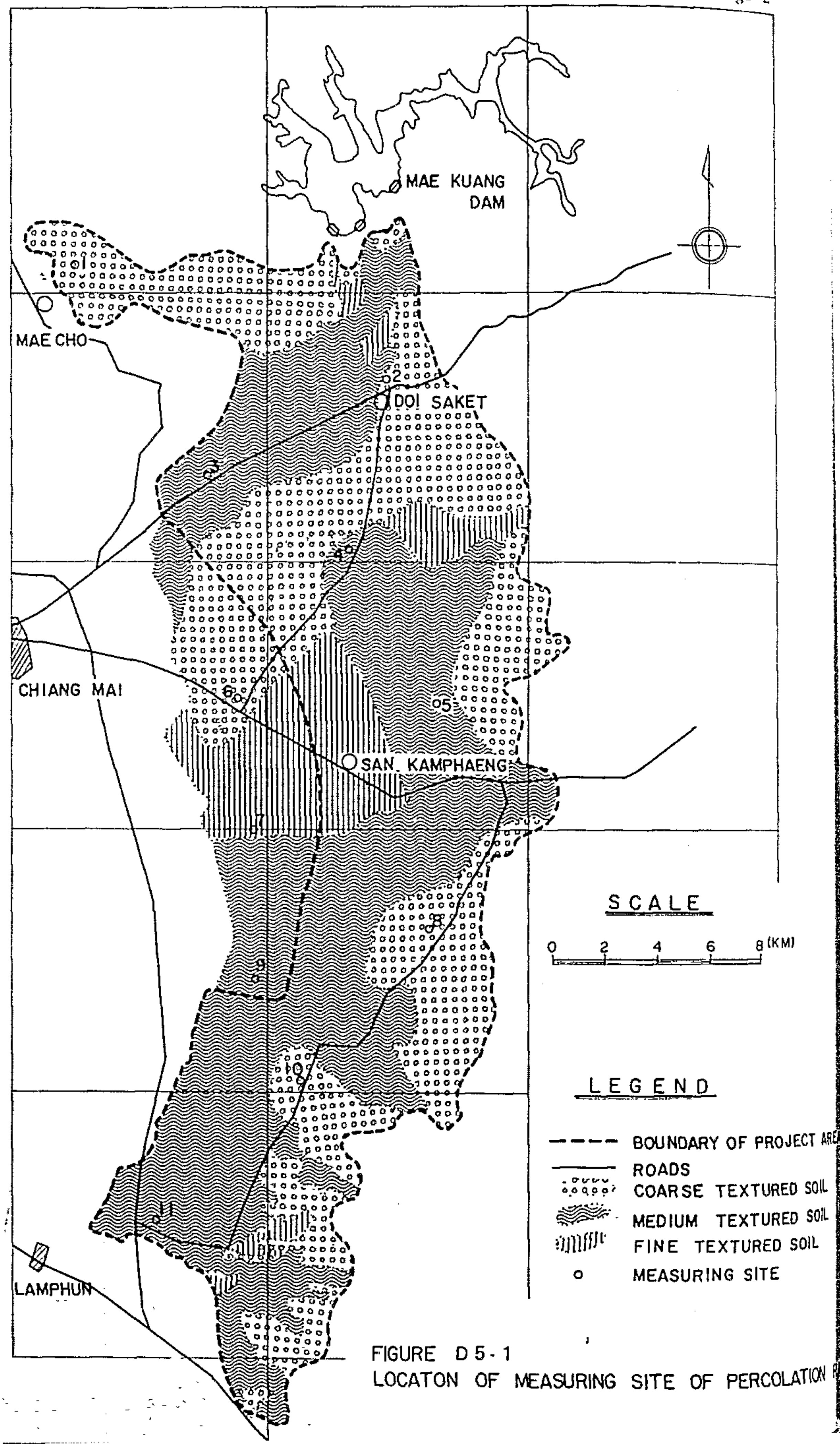


FIGURE D 5 - 1
LOCATON OF MEASURING SITE OF PERCOLATION R

Table D 6-1 Water Requirement for Land Soaking and Preparation

Wet Season Paddy Field

1. First irrigation		150 mm
Top soil saturation depth 150 mm, porosity 50%, soil moisture 35%	150mm x 0.50 x 0.65 = 50	
Percolation (1.5mm/day);	1.5mm x 30days = 40	
Standing water;	3.7mm x 16days = 60	
2. Second irrigation		50 mm
Evaporation in 14days;	3.7mm x 14days = 50	
Total		200 mm

Dry Season Paddy Field

1. First irrigation		180 mm
Top soil saturation depth 150 mm, porosity 65%, soil moisture 25%	150mm x 0.65 x 0.75 = 80	
Percolation (1.5mm/day);	1.5mm x 30days = 50	
Standing water;	3.2mm x 16days = 50	
2. Second irrigation		50 mm
Evaporation in 14days;	3.2mm x 14days = 50	
Total		230 mm

Calculation of Irrigation Water Requirement

1. Calculation of irrigation water requirement for whole Project Area
   - Crop calenders, croped area (rai)
   - Weighted rainfall (mm)
   - Effective rainfall (mm)
   - Diversion demand (MCM)
   - Diversion demand (cu.m/sec)
   - Accumulated demand (cu.m/sec)

2. Irrigation water requirement for Right Bank Area
   - Diversion demand (MCM)
   - Diversion demand (cu.m/sec)

3. Irrigation water requirement for Existing Irrigated Area
   - Diversion demand (MCM)
   - Diversion demand (cu.m/sec)

4. Irrigation water requirement for High and Downstream Area
   - Diversion demand (MCM)
   - Diversion demand (cu.m/sec)

ROYAL IRRIGATION DEPARTMENT, THAILAND
MAE KUANG PROJECT, CASE-4

COMPUTER CENTER
DEMAND MODEL 1

Table D 7-1

CROP CALENDARS, CROPPED AREAS IN RAI

CROP	ITEM	DESCRIPTION	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
1	0	RICE -RICE												
1	1	A.LAND PREPARATION	0.	0.	20603.	75906.	11928.	0.	0.	0.	0.	0.	10469.	5156.
		EVAPOTRANSPIRATION, MM	0.	0.	200.	200.	200.	0.	0.	0.	0.	0.	230	230
1	2	B.NURSERY	0.	0.	2060.	7591.	1193.	0.	0.	0.	0.	0.	1047.	516.
		EVAPOTRANSPIRATION, MM	0.	0.	400.	400.	400.	0.	0.	0.	0.	0.	450.	450.
1	3	C.TRANSPLANTING	15625.	10469.	0.	20603.	96509.	108437.	103341.	37953.	0.	0.	0.	10469.
		EVAPOTRANSPIRATION, MM	260.	263.	0.	182.	170.	182.	198.	155.	0.	0.	0.	209.
2	0	CORN	0.	0.	0.	0.	0.	0.	0.	0.	6781.	13563.	13563.	6781.
		EVAPOTRANSPIRATION, MM	0.	0.	0.	0.	0.	0.	0.	0.	29.	42.	147.	143.
3	0	GARLIC + VEGETABLE	0.	0.	0.	0.	0.	0.	0.	0.	4156.	8313.	8313.	4156.
		EVAPOTRANSPIRATION, MM	0.	0.	0.	0.	0.	0.	0.	0.	66.	74.	94.	110.
4	0	TOBACCO	0.	0.	0.	0.	0.	0.	0.	0.	1281.	5125.	4561.	154.
		EVAPOTRANSPIRATION, MM	0.	0.	0.	0.	0.	0.	0.	0.	38.	74.	134.	142.
5	0	SOY BEANS + GROUNDNUT(U	64496.	16453.	0.	0.	0.	0.	0.	0.	1316.	49359.	65813.	65813.
		EVAPOTRANSPIRATION, MM	135.	86.	0.	0.	0.	0.	0.	0.	29.	31.	67.	158.
6	0	SOY BEANS	0.	2723.	11756.	12375.	12375.	6188.	0.	0.	0.	0.	0.	0.
		EVAPOTRANSPIRATION, MM	0.	52.	69.	136.	95.	61.	0.	0.	0.	0.	0.	0.
7	0	TOBACCO	0.	0.	0.	0.	0.	0.	0.	908.	2750.	2750.	1843.	0.
		EVAPOTRANSPIRATION, MM	0.	0.	0.	0.	0.	0.	0.	44.	67.	105.	121.	0.
8	0	GROUNDNUT	0.	0.	0.	0.	0.	0.	0.	5583.	9625.	9625.	9625.	5583.
		EVAPOTRANSPIRATION, MM	0.	0.	0.	0.	0.	0.	0.	33.	47.	105.	107.	79.
9	0	LONGAN	4187.	4187.	4187.	4187.	4187.	4187.	4187.	4187.	4187.	4187.	4187.	4187.
		EVAPOTRANSPIRATION, MM	118.	120.	96.	95.	84.	85.	74.	77.	66.	74.	94.	110.
		EFFECTIVE RAIN FACTOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		FARM EFFICIENCY	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
		CANAL EFFICIENCY	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
		RETURN FLOW FACTOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		UNCROPPED AREA ETP, MM	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		MINIMUM DEMAND FACTOR	0.25											
		PROJECT AREA, RAI	125000.											
		EFFECTIVE RAINFALL COMOUTATION OPTION 2												

ROYAL IRRIGATION DEPARTMENT, THAILAND
MAE KUANG PROJECT, CASE-4

COMPUTER CENTER
DEMAND MODEL 2

Table D 7-2

WEIGHTED RAINFALL IN MILLIMETERS

WATER YEAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	ANNUAL
1952	2.50	80.40	224.50	204.10	269.40	217.60	84.40	21.00	0.00	22.60	37.60	0.00	1164.10
1953	96.60	71.80	230.40	157.60	177.30	364.70	148.40	66.30	6.40	0.10	4.70	58.60	1382.90
1954	43.70	232.20	91.80	52.80	309.50	199.30	165.20	4.30	1.80	0.20	5.00	21.50	1127.30
1955	29.30	103.80	120.60	119.60	299.80	180.20	90.20	21.80	0.00	0.00	5.50	0.00	970.80
1956	50.40	151.90	74.40	194.60	209.50	292.90	104.90	2.40	4.60	0.00	0.10	1.50	1087.20
1957	62.40	47.40	235.90	90.60	220.90	228.70	41.40	1.30	1.30	9.30	1.30	20.30	960.80
1958	87.10	61.40	147.10	123.00	202.10	192.60	162.90	5.20	1.30	10.30	1.30	13.00	1007.30
1959	30.50	116.00	56.90	179.60	237.40	261.20	72.90	1.40	1.30	22.30	1.30	4.60	985.40
1960	3.70	116.30	105.80	250.20	237.00	358.00	110.90	29.30	63.80	5.10	10.00	37.30	1327.40
1961	59.30	215.60	156.70	78.70	426.60	327.40	146.20	4.50	59.80	0.00	0.00	12.20	1487.00
1962	5.80	91.00	119.00	213.40	257.40	211.70	138.50	0.00	0.00	0.00	6.70	15.20	1058.70
1963	17.40	18.90	165.20	84.10	179.20	153.40	182.40	101.20	2.30	1.90	3.50	17.00	926.50
1964	66.10	185.10	88.90	228.90	149.20	278.30	164.40	38.20	0.70	0.00	9.30	6.20	1215.30
1965	0.00	68.90	93.70	61.40	206.10	186.60	157.70	77.10	7.10	7.90	5.60	0.30	872.40
1966	7.70	162.40	38.90	154.60	290.90	250.20	144.90	25.40	0.00	1.00	0.00	6.40	1082.40
1967	46.90	159.80	120.70	145.00	159.30	361.10	28.50	33.20	0.00	0.40	1.10	4.70	1060.70
1968	120.60	109.00	96.10	29.60	122.30	115.30	65.50	11.30	0.00	4.10	0.00	0.00	673.80
1969	13.90	172.50	62.00	105.30	179.30	99.70	43.00	43.90	3.30	0.00	0.00	30.60	753.50
1970	82.60	180.00	147.00	102.30	339.60	215.90	71.00	7.30	45.90	0.30	0.00	10.80	1202.70
1971	21.10	184.00	145.80	200.40	295.50	117.60	103.20	22.80	4.30	0.00	0.00	1.70	1096.40
1972	89.80	70.20	119.60	73.70	161.50	216.10	60.40	87.00	7.10	0.00	0.20	33.80	919.40
1973	5.10	102.70	107.80	153.10	339.00	251.70	49.60	28.40	4.40	4.40	4.40	21.20	1071.80
1974	63.80	107.90	100.70	86.50	144.50	222.80	122.60	64.70	9.10	82.70	5.60	5.00	1015.90
1975	16.30	100.20	218.30	203.50	365.50	172.40	175.80	56.40	41.10	4.40	10.50	13.00	1377.40
1976	18.60	86.50	116.00	102.70	217.10	171.10	142.10	16.50	5.80	37.80	4.90	28.10	947.20
1977	78.40	143.10	74.10	140.70	219.50	297.90	85.40	8.30	77.30	29.70	36.20	0.00	1190.60
1978	13.50	221.90	93.10	294.40	218.20	279.50	75.60	8.90	4.40	3.90	14.10	0.90	1228.40
1979	56.70	181.40	133.00	93.40	162.40	132.10	66.50	4.40	4.40	0.00	0.00	23.50	857.80
AVERAGE	42.49	126.51	124.43	140.14	235.57	227.00	107.30	28.30	12.77	8.87	6.03	13.84	1073.25

ROYAL IRRIGATION DEPARTMENT, THAILAND
MAE KUANG PROJECT, CASE-4

COMOUTER CENTER
DEMAND MODEL 3

Table D 7-3

EFFECTIVE RAINFALL IN MILLIMETERS

WATER YEAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	ANNUAL
1952	0.00	64.32	134.70	122.46	148.17	130.56	67.52	16.80	0.00	18.08	30.08	0.00	732.69
1953	77.28	57.44	138.24	110.32	124.11	182.35	103.88	53.04	0.00	0.00	0.00	46.88	893.54
1954	34.96	139.32	73.44	42.24	154.75	139.51	115.64	0.00	0.00	0.00	0.00	17.20	717.06
1955	23.44	72.66	84.42	83.72	164.89	126.14	72.16	17.44	0.00	0.00	0.00	0.00	644.87
1956	40.32	106.33	59.52	136.22	125.70	161.09	73.43	0.00	0.00	0.00	0.00	0.00	702.61
1957	49.92	37.92	141.54	72.48	132.54	137.22	33.12	0.00	0.00	0.00	0.00	16.24	620.98
1958	69.68	49.12	102.97	86.10	121.26	134.82	114.03	0.00	0.00	8.24	0.00	10.40	696.62
1959	24.40	81.20	45.52	125.72	142.44	143.66	58.32	0.00	0.00	17.84	0.00	0.00	639.10
1960	0.00	81.41	74.06	137.61	142.20	179.00	77.63	23.44	51.04	0.00	0.00	29.84	796.23
1961	47.44	129.36	109.69	62.96	213.30	163.70	102.34	0.00	47.84	0.00	0.00	9.76	886.39
1962	0.00	72.80	83.30	128.04	141.57	127.02	96.95	0.00	0.00	0.00	0.00	12.16	661.84
1963	13.92	15.12	115.64	67.28	125.44	107.38	127.68	70.84	0.00	0.00	0.00	13.60	656.90
1964	52.88	129.57	71.12	137.34	104.44	153.06	115.08	30.56	0.00	0.00	0.00	0.00	794.05
1965	0.00	55.12	74.96	49.12	123.66	130.62	110.39	61.68	0.00	0.00	0.00	0.00	605.55
1966	0.00	113.68	31.12	108.22	159.99	137.61	101.43	20.32	0.00	0.00	0.00	0.00	672.37
1967	37.52	111.86	84.49	101.50	111.51	180.55	22.80	26.56	0.00	0.00	0.00	0.00	676.79
1968	84.42	76.30	76.88	23.68	85.61	80.71	52.40	9.04	0.00	0.00	0.00	0.00	489.04
1969	11.12	120.75	49.60	73.71	125.51	79.76	34.40	35.12	0.00	0.00	0.00	24.48	554.45
1970	66.08	126.00	102.90	71.61	169.80	129.54	56.80	0.00	36.72	0.00	0.00	8.64	768.09
1971	16.88	128.80	102.06	120.24	162.52	82.32	72.24	18.24	0.00	0.00	0.00	0.00	703.30
1972	71.84	56.16	83.72	58.96	113.05	129.66	48.32	69.60	0.00	0.00	0.00	27.04	658.35
1973	0.00	71.89	75.46	107.17	169.50	138.43	39.68	22.72	0.00	0.00	0.00	16.96	641.81
1974	51.04	75.53	70.49	69.20	101.15	133.68	85.82	51.76	0.00	66.16	0.00	0.00	704.83
1975	13.04	70.14	130.98	122.10	182.75	120.68	123.06	45.12	32.88	0.00	8.40	10.40	859.55
1976	14.88	69.20	81.20	71.89	130.26	119.77	99.47	13.20	0.00	30.24	0.00	22.48	652.59
1977	62.72	100.17	59.28	98.49	131.70	163.84	68.32	0.00	61.84	23.76	28.96	0.00	799.08
1978	10.80	133.14	74.48	161.92	130.92	153.72	60.48	0.00	0.00	0.00	11.28	0.00	736.74
1979	45.36	126.98	93.10	74.72	113.68	92.47	53.20	0.00	0.00	0.00	0.00	18.80	618.31
AVERAGE	32.85	88.30	86.60	93.75	137.59	134.25	78.09	20.91	8.23	5.87	2.81	10.17	699.42

ROYAL IRRIGATION DEPARTMENT, THAILAND
MAE KUANG PROJECT, CASE-4

COMOUTER CENTER
DEMAND MODEL 4

Table D 7-4

DIVERSION DEMAND IN MILLION CUBIC METERS

WATER YEAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	ANNUAL
1952	32.72	6.66	5.42	24.05	13.33	14.25	33.51	13.90	3.63	7.48	22.12	40.60	217.67
1953	16.63	7.18	5.22	27.17	14.90	12.64	24.23	9.98	3.63	11.63	30.99	28.70	192.91
1954	25.44	4.45	8.85	46.80	13.26	12.64	21.23	15.92	3.63	11.63	30.99	36.24	231.07
1955	27.84	6.36	8.23	34.57	13.23	15.43	32.33	13.82	3.63	11.63	30.99	40.60	238.66
1956	24.32	5.31	9.76	20.51	14.47	12.64	32.00	15.92	3.63	11.63	30.99	40.60	221.79
1957	22.32	8.69	5.04	37.80	13.84	12.64	42.52	15.92	3.63	11.63	30.99	36.48	241.49
1958	18.21	7.82	7.20	33.88	15.67	13.11	21.64	15.92	3.63	9.74	30.99	37.96	215.78
1959	27.64	6.05	10.87	23.21	13.52	12.64	35.86	15.92	3.63	7.53	30.99	40.60	228.46
1960	32.72	6.04	8.81	20.21	13.53	12.64	30.93	13.10	0.91	11.63	30.99	33.03	214.53
1961	22.84	4.71	6.82	40.62	13.09	12.64	24.62	15.92	0.96	11.63	30.99	38.13	222.97
1962	32.72	6.35	8.30	22.61	13.55	15.20	26.00	15.92	3.63	11.63	30.99	37.52	224.41
1963	29.82	10.59	6.49	39.34	14.54	20.46	18.16	8.26	3.63	11.63	30.99	37.15	231.06
1964	21.71	4.71	8.99	20.27	20.23	12.64	21.37	12.33	3.63	11.63	30.99	40.60	209.09
1965	32.72	7.36	8.76	44.75	15.02	14.23	22.57	9.12	3.63	11.63	30.99	40.60	241.39
1966	32.72	5.12	12.24	27.71	13.24	12.64	24.86	13.48	3.63	11.63	30.99	40.60	228.86
1967	24.91	5.16	8.23	29.45	18.31	12.64	45.26	12.75	3.63	11.63	30.99	40.60	243.57
1968	15.14	6.22	8.66	52.33	25.32	27.60	37.40	14.83	3.63	11.63	30.99	40.60	274.35
1969	30.40	4.93	10.48	37.45	14.52	27.85	42.18	11.85	3.63	11.63	30.99	34.39	260.30
1970	18.96	4.80	7.20	38.05	13.22	14.52	36.24	15.92	1.27	11.63	30.99	38.41	231.20
1971	29.20	4.73	7.25	24.62	13.24	27.17	32.31	13.73	3.63	11.63	30.99	40.60	239.08
1972	17.76	7.28	8.27	41.81	17.90	14.49	38.48	8.38	3.63	11.63	30.99	33.74	234.37
1973	32.72	6.38	8.74	27.98	13.22	12.64	40.77	13.19	3.63	11.63	30.99	36.30	238.18
1974	22.09	6.25	9.03	38.76	21.12	13.42	28.84	10.12	3.63	3.29	30.99	40.60	228.15
1975	30.00	6.45	5.63	24.16	13.18	16.90	19.34	10.81	1.44	11.63	28.51	37.96	205.98
1976	29.62	6.48	8.41	37.97	13.91	17.14	25.36	14.33	3.63	5.51	30.99	34.90	228.26
1977	19.66	5.47	9.78	30.32	13.87	12.64	33.31	15.92	0.91	6.21	22.45	40.60	211.12
1978	30.47	4.61	8.79	17.43	13.89	12.64	35.31	15.92	3.63	11.63	27.66	40.60	222.59
1979	23.27	4.77	7.75	37.16	17.73	24.45	37.19	15.92	3.63	11.63	30.99	35.83	250.31
AVERAGE	25.88	6.10	8.19	32.18	15.17	15.73	30.85	13.54	3.18	10.56	30.16	38.02	229.56

ROYAL IRRIGATION DEPARTMENT, THAILAND
MAE KUANG PROJECT, CASE-4

COMPUTER CENTER
DEMAND MODEL 5

Table D 7-5

DIVERSION DEMAND IN CUBIC METERS PER SECOND

WATER YEAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	ANNUAL
1952	12.622	2.486	2.091	8.979	4.978	5.498	12.511	5.362	1.357	2.793	9.144	15.160	6.902
1953	6.415	2.681	2.015	10.144	5.564	4.877	9.047	3.851	1.357	4.341	12.810	10.716	6.117
1954	9.814	1.663	3.414	17.471	4.951	4.877	7.927	6.141	1.357	4.341	12.810	13.529	7.327
1955	10.739	2.373	3.177	12.906	4.940	5.954	12.069	5.333	1.357	4.341	12.810	15.160	7.568
1956	9.384	1.981	3.765	7.658	5.403	4.877	11.948	6.141	1.357	4.341	12.810	15.160	7.033
1957	8.613	3.243	1.944	14.113	5.167	4.877	15.874	6.141	1.357	4.341	12.810	13.620	7.658
1958	7.026	2.920	2.776	12.650	5.852	5.058	8.080	6.141	1.357	3.635	12.810	14.174	6.842
1959	10.662	2.258	4.193	8.666	5.047	4.877	13.388	6.141	1.357	2.813	12.810	15.160	7.244
1960	12.622	2.255	3.401	7.546	5.050	4.877	11.548	5.055	0.339	4.341	12.810	12.331	6.803
1961	8.812	1.759	2.631	15.167	4.886	4.877	9.194	6.141	0.359	4.341	12.810	14.234	7.070
1962	12.622	2.371	3.201	8.443	5.058	5.864	9.707	6.141	1.357	4.341	12.810	14.007	7.116
1963	11.504	3.954	2.503	14.686	5.430	7.892	6.780	3.188	1.357	4.341	12.810	13.871	7.327
1964	8.375	1.757	3.468	7.567	7.552	4.877	7.980	4.756	1.357	4.341	12.810	15.160	6.630
1965	12.622	2.748	3.381	16.706	5.610	5.492	8.427	3.519	1.357	4.341	12.810	15.160	7.654
1966	12.622	1.910	4.723	10.345	4.945	4.877	9.281	5.199	1.357	4.341	12.810	15.160	7.257
1967	9.609	1.928	3.175	10.997	6.837	4.877	16.897	4.920	1.357	4.341	12.810	15.160	7.724
1968	5.842	2.324	3.340	19.536	9.455	10.647	13.963	5.722	1.357	4.341	12.810	15.160	8.700
1969	11.729	1.842	4.043	13.981	5.423	10.745	15.747	4.571	1.357	4.341	12.810	12.839	8.254
1970	7.315	1.791	2.778	14.206	4.934	5.603	13.532	6.141	0.473	4.341	12.810	14.341	7.331
1971	11.266	1.764	2.796	9.192	4.942	10.481	12.061	5.296	1.357	4.341	12.810	15.160	7.581
1972	6.852	2.718	3.192	15.612	6.682	5.591	14.367	3.233	1.357	4.341	12.810	12.597	7.432
1973	12.622	2.383	3.370	10.446	4.935	4.877	15.224	5.088	1.357	4.341	12.810	13.552	7.553
1974	8.523	2.334	3.485	14.473	7.885	5.176	10.768	3.903	1.357	1.230	12.810	15.160	7.235
1975	11.575	2.407	2.172	9.013	4.920	6.518	7.220	4.169	0.536	4.341	11.786	14.174	6.531
1976	11.427	2.420	3.246	14.176	5.195	6.612	9.467	5.529	1.357	2.059	12.810	13.029	7.238
1977	7.585	2.041	3.771	11.320	5.177	4.877	12.435	6.141	0.339	2.319	9.280	15.160	6.695
1978	11.755	1.722	3.391	6.509	5.187	4.877	13.182	6.141	1.357	4.341	11.435	15.160	7.058
1979	8.979	1.782	2.990	13.872	6.618	9.432	13.883	6.141	1.357	4.341	12.810	13.378	7.937
AVERAGE	9.983	2.279	3.158	12.013	5.665	6.070	11.518	5.223	1.188	3.941	12.467	14.195	7.279

ROYAL IRRIGATION DEPARTMENT, THAILAND
MAE KUANG PROJECT, CASE-4

COMOUTER CENTER
DEMAND MODEL 6

Table D 7-6

ACCUMULATED DEMAND IN MILLION CUBIC METERS

WATER YEAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
1952	32.7	39.4	44.8	68.8	82.2	96.4	129.9	143.8	147.5	154.9	177.1	217.7
1953	234.3	241.5	246.7	273.9	288.8	301.4	325.6	335.6	339.3	350.9	381.9	410.6
1954	436.0	440.5	449.3	496.1	509.4	522.0	543.3	559.2	562.8	574.4	605.4	641.7
1955	669.5	675.8	684.1	718.7	731.9	747.3	779.6	793.5	797.1	808.7	839.7	880.3
1956	904.6	909.9	919.7	940.2	954.7	967.3	999.3	1015.2	1018.9	1030.5	1061.5	1102.1
1957	1124.4	1133.1	1138.2	1176.0	1189.8	1202.4	1244.9	1260.9	1264.5	1276.1	1307.1	1343.6
1958	1361.8	1369.6	1376.8	1410.7	1426.4	1439.5	1461.1	1477.0	1480.7	1490.4	1521.4	1559.4
1959	1587.0	1593.1	1603.9	1627.1	1640.7	1653.3	1689.1	1705.1	1708.7	1716.2	1747.2	1787.8
1960	1820.5	1826.6	1835.4	1855.6	1869.1	1881.8	1912.7	1925.8	1926.7	1938.3	1969.3	2002.4
1961	2025.2	2029.9	2036.7	2077.4	2090.4	2103.1	2127.7	2143.6	2144.6	2156.2	2187.2	2225.3
1962	2258.0	2264.4	2272.7	2295.3	2308.9	2324.0	2350.0	2366.0	2369.6	2381.2	2412.2	2449.7
1963	2479.6	2490.1	2496.6	2536.0	2550.5	2571.0	2589.1	2597.4	2601.0	2612.6	2643.6	2680.8
1964	2702.5	2707.2	2716.2	2736.5	2756.7	2769.3	2790.7	2803.0	2806.7	2818.3	2849.3	2889.9
1965	2922.6	2930.0	2938.7	2983.5	2998.5	3012.7	3035.3	3044.4	3048.1	3059.7	3090.7	3131.3
1966	3164.0	3169.1	3181.3	3209.1	3222.3	3234.9	3259.8	3273.3	3276.9	3288.5	3319.5	3360.1
1967	3385.0	3390.2	3398.4	3427.9	3446.2	3458.8	3504.1	3516.8	3520.5	3532.1	3563.1	3603.7
1968	3618.8	3625.1	3633.7	3686.0	3711.4	3739.0	3776.4	3791.2	3794.8	3806.5	3837.4	3878.0
1969	3908.4	3913.4	3923.9	3961.3	3975.8	4003.7	4045.9	4057.7	4061.3	4073.0	4104.0	4138.3
1970	4157.3	4162.1	4169.3	4207.3	4220.6	4235.1	4271.3	4287.2	4288.5	4300.1	4331.1	4369.5
1971	4398.7	4403.4	4410.7	4435.3	4448.5	4475.7	4508.0	4521.7	4525.4	4537.0	4568.0	4608.6
1972	4626.3	4633.6	4641.9	4683.7	4701.6	4716.1	4754.6	4762.9	4766.6	4778.2	4809.2	4842.9
1973	4875.6	4882.0	4890.8	4918.7	4931.9	4944.6	4985.4	4998.5	5002.2	5013.8	5044.8	5081.1
1974	5103.2	5109.4	5118.5	5157.2	5178.3	5191.8	5220.6	5230.7	5234.3	5237.6	5268.6	5309.2
1975	5339.2	5345.7	5351.3	5375.4	5388.6	5405.5	5424.8	5435.6	5437.1	5448.7	5477.2	5515.2
1976	5544.8	5551.3	5559.7	5597.7	5611.6	5628.7	5654.1	5668.4	5672.0	5677.5	5708.5	5743.4
1977	5763.1	5768.5	5778.3	5808.6	5822.5	5835.1	5868.4	5884.7	5885.3	5891.5	5913.9	5954.5
1978	5985.0	5989.6	5998.4	6015.8	6029.7	6042.3	6077.6	6093.[illegible]	6097.2	6108.8	6136.5	6177.1
1979	6200.3	6205.1	6212.9	6250.0	6267.7	6292.2	6329.4	6345.3	6348.9	6360.5	6391.5	6427.4

ROYAL IRRIGATION DEPARTMENT, THAILAND
MAE KUANG PROJECT, CASE 4-1(RIGHT BANK AREA)

COMPUTER CENTER
DEMAND MODEL 4

Table D 7-7

DIVERSION DEMAND IN MILLION CUBIC METERS

WATER YEAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	ANNUAL
1952	1.65	0.41	0.61	1.66	1.04	0.82	1.49	1.04	1.36	2.09	2.17	2.55	16.90
1953	0.65	0.46	0.60	1.79	1.11	0.76	1.10	0.61	1.36	2.67	3.15	1.51	15.78
1954	1.20	0.26	0.75	3.71	1.04	0.76	0.98	1.36	1.36	2.67	3.15	2.17	19.40
1955	1.35	0.36	0.73	2.39	1.04	0.87	1.44	1.03	1.36	2.67	3.15	2.55	18.94
1956	1.13	0.26	0.86	1.52	1.09	0.76	1.43	1.36	1.36	2.67	3.15	2.55	18.12
1957	1.00	0.61	0.60	2.70	1.06	0.76	1.98	1.36	1.36	2.67	3.15	2.19	19.44
1958	0.75	0.52	0.69	2.32	1.14	0.78	1.00	1.36	1.36	2.40	3.15	2.32	17.78
1959	1.33	0.31	1.07	1.63	1.05	0.76	1.59	1.36	1.36	2.09	3.15	2.55	18.25
1960	1.65	0.31	0.75	1.50	1.05	0.76	1.38	0.92	0.34	2.67	3.15	1.89	16.37
1961	1.04	0.26	0.67	3.01	1.03	0.76	1.12	1.36	0.36	2.67	3.15	2.33	17.76
1962	1.65	0.36	0.73	1.60	1.05	0.86	1.18	1.36	1.36	2.67	3.15	2.28	18.25
1963	1.47	0.87	0.66	2.87	1.09	1.08	0.85	0.52	1.36	2.67	3.15	2.25	18.83
1964	0.97	0.26	0.77	1.51	1.33	0.76	0.98	0.83	1.36	2.67	3.15	2.55	17.13
1965	1.65	0.48	0.75	3.48	1.11	0.82	1.03	0.55	1.36	2.67	3.15	2.55	19.61
1966	1.65	0.26	1.42	1.81	1.04	0.76	1.13	0.98	1.36	2.67	3.15	2.55	18.78
1967	1.16	0.26	0.73	1.90	1.25	0.76	2.15	0.88	1.36	2.67	3.15	2.55	18.81
1968	0.56	0.34	0.75	4.33	1.54	1.38	1.66	1.19	1.36	2.67	3.15	2.55	21.47
1969	1.51	0.26	0.97	2.67	1.09	1.39	1.96	0.79	1.36	2.67	3.15	2.01	19.82
1970	0.79	0.26	0.69	2.73	1.04	0.83	1.60	1.36	0.48	2.67	3.15	2.36	17.95
1971	1.43	0.26	0.69	1.69	1.04	1.36	1.44	1.02	1.36	2.67	3.15	2.55	18.65
1972	0.72	0.47	0.73	3.15	1.23	0.83	1.73	0.52	1.36	2.67	3.15	1.95	18.52
1973	1.65	0.36	0.75	1.83	1.04	0.76	1.87	0.93	1.36	2.67	3.15	2.18	18.54
1974	0.99	0.34	0.77	2.81	1.36	0.79	1.29	0.63	1.36	0.88	3.15	2.55	16.93
1975	1.48	0.37	0.62	1.67	1.04	0.93	0.90	0.69	0.56	2.67	2.88	2.32	16.12
1976	1.46	0.38	0.74	2.72	1.07	0.94	1.15	1.11	1.36	1.73	3.15	2.05	17.86
1977	0.84	0.26	0.86	1.98	1.06	0.76	1.48	1.36	0.34	1.91	2.21	2.55	15.60
1978	1.51	0.26	0.75	1.39	1.06	0.76	1.56	1.36	1.3	2.67	2.78	2.55	18.01
1979	1.06	0.26	0.71	2.64	1.22	1.25	1.65	1.36	1.36	2.67	3.15	2.13	19.46
AVERAGE	1.23	0.36	0.76	2.32	1.12	0.89	1.40	1.04	1.19	2.49	3.06	2.33	18.18

ROYAL IRRIGATION DEPARTMENT, THAILAND
MAE KUANG PROJECT, CASE 4-1 (RIGHT BANK AREA)

COMOUTER CENTER
DEMAND MODEL 5

Table D 7-8

DIVERSION DEMAND IN CUBIC METERS PER SECOND

WATER YEAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	ANNUAL
1952	0.637	0.152	0.236	0.621	0.389	0.318	0.556	0.403	0.509	0.779	0.897	0.952	0.536
1953	0.250	0.171	0.233	0.669	0.413	0.292	0.412	0.237	0.509	0.995	1.302	0.565	0.500
1954	0.462	0.097	0.291	1.385	0.388	0.292	0.365	0.523	0.509	0.995	1.302	0.810	0.615
1955	0.520	0.134	0.281	0.893	0.387	0.337	0.537	0.398	0.509	0.995	1.302	0.952	0.600
1956	0.435	0.097	0.331	0.566	0.407	0.292	0.532	0.523	0.509	0.995	1.302	0.952	0.575
1957	0.387	0.228	0.230	1.009	0.397	0.292	0.739	0.523	0.509	0.995	1.302	0.818	0.616
1958	0.288	0.195	0.264	0.868	0.425	0.300	0.372	0.523	0.509	0.897	1.302	0.866	0.564
1959	0.515	0.116	0.414	0.608	0.392	0.292	0.592	0.523	0.509	0.782	1.302	0.952	0.579
1960	0.637	0.115	0.290	0.561	0.392	0.292	0.516	0.355	0.127	0.995	1.302	0.706	0.519
1961	0.400	0.097	0.258	1.126	0.385	0.292	0.418	0.523	0.135	0.995	1.302	0.872	0.563
1962	0.637	0.134	0.282	0.599	0.392	0.333	0.439	0.523	0.509	0.995	1.302	0.852	0.579
1963	0.567	0.324	0.253	1.072	0.408	0.417	0.318	0.199	0.509	0.995	1.302	0.840	0.597
1964	0.372	0.097	0.295	0.562	0.496	0.292	0.368	0.322	0.509	0.995	1.302	0.952	0.543
1965	0.637	0.178	0.290	1.299	0.415	0.318	0.386	0.213	0.509	0.995	1.302	0.952	0.622
1966	0.637	0.097	0.549	0.678	0.388	0.292	0.422	0.378	0.509	0.995	1.302	0.952	0.596
1967	0.449	0.097	0.281	0.708	0.466	0.292	0.802	0.338	0.509	0.995	1.302	0.952	0.596
1968	0.215	0.126	0.288	1.617	0.575	0.531	0.622	0.459	0.509	0.995	1.302	0.952	0.681
1969	0.581	0.097	0.376	0.996	0.407	0.536	0.731	0.304	0.509	0.995	1.302	0.750	0.629
1970	0.306	0.097	0.264	1.018	0.387	0.322	0.598	0.523	0.180	0.995	1.302	0.881	0.569
1971	0.553	0.097	0.265	0.630	0.387	0.525	0.537	0.393	0.509	0.995	1.302	0.952	0.591
1972	0.278	0.175	0.282	1.176	0.460	0.322	0.646	0.201	0.509	0.995	1.302	0.729	0.587
1973	0.637	0.136	0.289	0.682	0.387	0.292	0.699	0.361	0.509	0.995	1.302	0.812	0.588
1974	0.382	0.128	0.297	1.047	0.510	0.304	0.483	0.242	0.509	0.330	1.302	0.952	0.537
1975	0.572	0.139	0.239	0.622	0.386	0.360	0.336	0.267	0.209	0.995	1.189	0.866	0.511
1976	0.563	0.141	0.284	1.015	0.398	0.364	0.429	0.429	0.509	0.647	1.302	0.767	0.566
1977	0.323	0.097	0.332	0.739	0.397	0.292	0.552	0.523	0.127	0.711	0.912	0.952	0.495
1978	0.583	0.097	0.290	0.518	0.398	0.292	0.583	0.523	0.509	0.995	1.150	0.952	0.571
1979	0.410	0.097	0.273	0.986	0.457	0.481	0.617	0.523	0.509	0.995	1.302	0.797	0.617
AVERAGE	0.473	0.134	0.295	0.867	0.417	0.342	0.522	0.402	0.446	0.930	1.264	0.868	0.577

ROYAL IRRIGATION DEPARTMENT, THAILAND
MAE KUANG PROJECT, CASE 4-2(EXISTING IRRIGATED AREA)

COMPUTER CENTER
DEMAND MODEL 4

Table D 7-9

DIVERSION DEMAND IN MILLION CUBIC METERS

WATER YEAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	ANNUAL
1952	13.73	2.54	1.88	9.18	5.00	5.57	13.44	5.24	0.46	1.51	7.68	16.51	82.75
1953	7.02	2.73	1.80	10.44	5.63	4.92	9.70	3.87	0.46	2.85	10.82	11.92	72.16
1954	10.70	1.72	3.27	17.50	4.97	4.92	8.49	5.88	0.46	2.85	10.82	14.82	86.39
1955	11.70	2.45	3.02	13.20	4.96	6.05	12.97	5.22	0.46	2.85	10.82	16.51	90.18
1956	10.23	2.08	3.58	7.76	5.46	4.92	12.83	5.88	0.46	2.85	10.82	16.51	83.37
1957	9.40	3.30	1.73	14.37	5.20	4.92	16.98	5.88	0.46	2.85	10.82	14.92	90.81
1958	7.68	2.97	2.60	12.96	5.94	5.11	8.65	5.88	0.46	2.24	10.82	15.49	80.80
1959	11.61	2.35	3.90	8.85	5.07	4.92	14.39	5.88	0.46	1.53	10.82	16.51	86.28
1960	13.73	2.35	3.25	7.64	5.08	4.92	12.40	4.99	0.11	2.85	10.82	13.58	81.72
1961	9.61	1.83	2.45	15.36	4.90	4.92	9.86	5.88	0.12	2.85	10.82	15.55	84.14
1962	13.73	2.45	3.05	8.61	5.08	5.95	10.41	5.88	0.46	2.85	10.82	15.31	84.59
1963	12.52	3.96	2.32	14.91	5.49	8.07	7.25	3.20	0.46	2.85	10.82	15.17	87.01
1964	9.14	1.83	3.32	7.66	7.78	4.92	8.55	4.72	0.46	2.85	10.82	16.51	78.54
1965	13.73	2.80	3.23	16.79	5.68	5.56	9.03	3.54	0.46	2.85	10.82	16.51	91.00
1966	13.73	2.00	4.22	10.66	4.96	4.92	9.95	5.11	0.46	2.85	10.82	16.51	86.19
1967	10.48	2.02	3.02	11.36	7.01	4.92	18.05	4.87	0.46	2.85	10.82	16.51	92.35
1968	6.40	2.41	3.19	19.43	9.84	10.95	15.00	5.53	0.46	2.85	10.82	16.51	103.38
1969	12.77	1.93	3.81	14.24	5.48	11.06	16.85	4.55	0.46	2.85	10.82	14.11	98.91
1970	8.00	1.87	2.60	14.46	4.95	5.68	14.55	5.88	0.17	2.85	10.82	15.66	87.46
1971	12.27	1.84	2.62	9.41	4.96	10.78	12.96	5.19	0.46	2.85	10.82	16.51	90.65
1972	7.50	2.77	3.04	15.77	6.84	5.66	15.42	3.24	0.46	2.85	10.82	13.86	88.22
1973	13.73	2.46	3.22	10.77	4.95	4.92	16.31	5.02	0.46	2.85	10.82	14.84	90.34
1974	9.30	2.42	3.33	14.71	8.14	5.23	11.56	3.92	0.46	0.71	10.82	16.51	87.10
1975	12.60	2.48	1.97	9.22	4.94	6.63	7.73	4.17	0.18	2.85	9.94	15.49	78.19
1976	12.44	2.49	3.09	14.43	5.23	6.73	10.15	5.38	0.46	0.98	10.82	14.30	86.51
1977	8.29	2.15	3.59	11.67	5.21	4.92	13.36	5.88	0.11	1.11	7.80	16.51	80.59
1978	12.80	1.79	3.24	6.52	5.22	4.92	14.17	5.88	0.46	2.85	9.64	16.51	83.98
1979	9.79	1.86	2.82	14.14	6.77	9.68	14.92	5.88	0.46	2.85	10.82	14.66	94.65
AVERAGE	10.88	2.35	2.97	12.21	5.74	6.17	12.35	5.09	0.40	2.52	10.52	15.51	86.72

ROYAL IRRIGATION DEPARTMENT, THAILAND
MAE KUANG PROJECT, CASE 4-2(EXISTING IRRIGATED AREA)

COMOUTER CENTER
DEMAND MODEL 5

Table D 7-10

DIVERSION DEMAND IN CUBIC METERS PER SECOND

WATER YEAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	ANNUAL
1952	5.298	0.948	0.727	3.429	1.866	2.148	5.019	2.022	0.172	0.564	3.175	6.162	2.624
1953	2.709	1.021	0.696	3.899	2.103	1.897	3.621	1.493	0.172	1.063	4.471	4.449	2.288
1954	4.127	0.644	1.261	6.535	1.855	1.897	3.169	2.267	0.172	1.063	4.471	5.534	2.739
1955	4.513	0.914	1.165	4.929	1.851	2.332	4.841	2.012	0.172	1.063	4.471	6.162	2.860
1956	3.948	0.777	1.382	2.896	2.038	1.897	4.792	2.267	0.172	1.063	4.471	6.162	2.644
1957	3.626	1.231	0.668	5.364	1.943	1.897	6.341	2.267	0.172	1.063	4.471	5.569	2.880
1958	2.964	1.111	1.004	4.837	2.219	1.970	3.231	2.267	0.172	0.836	4.471	5.782	2.562
1959	4.481	0.879	1.504	3.303	1.894	1.897	5.373	2.267	0.172	0.571	4.471	6.162	2.736
1960	5.298	0.878	1.255	2.851	1.895	1.897	4.630	1.925	0.043	1.063	4.471	5.072	2.591
1961	3.709	0.684	0.945	5.733	1.829	1.897	3.681	2.267	0.046	1.063	4.471	5.806	2.668
1962	5.298	0.913	1.175	3.213	1.898	2.296	3.888	2.267	0.172	1.063	4.471	5.718	2.682
1963	4.832	1.477	0.893	5.566	2.048	3.114	2.707	1.233	0.172	1.063	4.471	5.665	2.759
1964	3.527	0.683	1.281	2.859	2.905	1.897	3.191	1.821	0.172	1.063	4.471	6.162	2.491
1965	5.298	1.046	1.247	6.269	2.121	2.145	3.371	1.367	0.172	1.063	4.471	6.162	2.886
1966	5.298	0.748	1.629	3.980	1.853	1.897	3.716	1.970	0.172	1.063	4.471	6.162	2.733
1967	4.041	0.755	1.164	4.241	2.616	1.897	6.738	1.879	0.172	1.063	4.471	6.162	2.928
1968	2.470	0.899	1.231	7.254	3.672	4.226	5.600	2.135	0.172	1.063	4.471	6.162	3.278
1969	4.926	0.719	1.468	5.317	2.046	4.265	6.292	1.755	0.172	1.063	4.471	5.268	3.136
1970	3.085	0.698	1.004	5.398	1.849	2.191	5.431	2.267	0.062	1.063	4.471	5.847	2.773
1971	4.733	0.686	1.011	3.515	1.852	4.158	4.838	2.001	0.172	1.063	4.471	6.162	2.875
1972	2.892	1.035	1.171	5.888	2.554	2.185	5.757	1.252	0.172	1.063	4.471	5.174	2.797
1973	5.298	0.917	1.243	4.021	1.849	1.897	6.089	1.935	0.172	1.063	4.471	5.542	2.865
1974	3.588	0.902	1.286	5.491	3.039	2.018	4.316	1.512	0.172	0.266	4.471	6.162	2.762
1975	4.861	0.924	0.760	3.443	1.843	2.560	2.884	1.609	0.068	1.063	4.109	5.782	2.479
1976	4.800	0.928	1.193	5.387	1.954	2.598	3.791	2.074	0.172	0.366	4.471	5.341	2.743
1977	3.197	0.802	1.384	4.357	1.947	1.897	4.988	2.267	0.043	0.414	3.223	6.162	2.555
1978	4.937	0.669	1.252	2.433	1.950	1.897	5.290	2.267	0.172	1.063	3.985	6.162	2.663
1979	3.779	0.694	1.089	5.278	2.528	3.735	5.569	2.267	0.172	1.063	4.471	5.475	3.001
AVERAGE	4.198	0.878	1.146	4.560	2.143	2.379	4.613	1.962	0.150	0.943	4.350	5.790	2.750

ROYAL IRRIGATION DEPARTMENT, THAILAND
MAE KUANG PROJECT, CASE 4-3(HIGH AND DOWNSTREAM AREA)

COMOUTER CENTER
DEMAND MODEL 4

Table D 7-11

DIVERSION DEMAND IN MILLION CUBIC METERS

WATER YEAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	ANNUAL
1952	17.33	3.71	2.92	13.20	7.29	7.86	18.58	7.61	1.82	3.89	12.59	21.72	118.52
1953	8.96	3.99	2.81	14.93	8.16	6.97	13.43	5.50	1.82	6.12	17.36	15.42	105.47
1954	13.54	2.47	4.83	25.58	7.25	6.97	11.76	8.68	1.82	6.12	17.36	19.41	125.79
1955	14.79	3.55	4.49	18.97	7.24	8.52	17.92	7.57	1.82	6.12	17.36	21.72	130.06
1956	12.96	2.96	5.32	11.24	7.92	6.97	17.74	8.68	1.82	6.12	17.36	21.72	120.81
1957	11.92	4.78	2.71	20.73	7.57	6.97	23.55	8.68	1.82	6.12	17.36	19.54	131.75
1958	9.78	4.32	3.91	18.60	8.59	7.23	11.99	8.68	1.82	5.10	17.36	20.32	117.71
1959	14.69	3.38	5.90	12.74	7.40	6.97	19.88	8.68	1.82	3.92	17.36	21.72	124.44
1960	17.33	3.38	4.81	11.07	7.40	6.97	17.15	7.19	0.45	6.12	17.36	17.71	116.94
1961	12.19	2.62	3.70	22.25	7.16	6.97	13.65	8.68	0.48	6.12	17.36	20.41	121.58
1962	17.33	3.55	4.52	12.40	7.41	8.39	14.41	8.68	1.82	6.12	17.36	20.08	122.08
1963	15.82	5.77	3.52	21.56	7.96	11.30	10.06	4.55	1.82	6.12	17.36	19.89	125.73
1964	11.60	2.62	4.90	11.10	11.12	6.97	11.84	6.77	1.82	6.12	17.36	21.72	113.94
1965	17.33	4.08	4.78	24.48	8.23	7.85	12.51	5.02	1.82	6.12	17.36	21.72	131.30
1966	17.33	2.85	6.59	15.23	7.24	6.97	13.78	7.39	1.82	6.12	17.36	21.72	124.40
1967	13.27	2.88	4.48	16.20	10.06	6.97	25.06	7.00	1.82	6.12	17.36	21.72	132.93
1968	8.18	3.48	4.72	28.57	13.95	15.27	20.73	8.11	1.82	6.12	17.36	21.72	150.02
1969	16.13	2.75	5.70	20.54	7.95	15.41	23.37	6.51	1.82	6.12	17.36	18.43	142.08
1970	10.17	2.67	3.91	20.86	7.23	8.01	20.10	8.68	0.62	6.12	17.36	20.56	126.30
1971	15.50	2.63	3.94	13.52	7.24	15.03	17.91	7.52	1.82	6.12	17.36	21.72	130.30
1972	9.55	4.04	4.51	22.90	9.83	7.99	21.33	4.61	1.82	6.12	17.36	18.09	128.14
1973	17.33	3.56	4.76	15.38	7.23	6.97	22.59	7.24	1.82	6.12	17.36	19.44	129.80
1974	11.80	3.49	4.93	21.25	11.61	7.40	15.99	5.57	1.82	1.70	17.36	21.72	124.63
1975	15.92	3.60	3.04	13.25	7.21	9.33	10.71	5.95	0.70	6.12	16.03	20.32	112.17
1976	15.72	3.62	4.59	20.82	7.61	9.46	14.05	7.84	1.82	2.81	17.36	18.70	124.40
1977	10.53	3.06	5.33	16.67	7.59	6.97	18.47	8.68	0.45	3.20	12.76	21.72	115.43
1978	16.16	2.56	4.79	9.53	7.60	6.97	19.58	8.68	1.82	6.12	15.57	21.72	121.10
1979	12.42	2.65	4.22	20.38	9.73	13.52	20.62	8.68	1.82	6.12	17.36	19.19	136.71
AVERAGE	13.77	3.39	4.45	17.64	8.31	8.68	17.10	7.41	1.59	5.55	16.92	20.35	125.16

ROYAL IRRIGATION DEPARTMENT, THAILAND
MAE KUANG PROJECT, CASE 4-3(HIGH AND DOWNSTREAM AREA)

COMOUTER CENTER
DEMAND MODEL 5

Table D 7-12

DIVERSION DEMAND IN CUBIC METERS PER SECOND

WATER YEAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	ANNUAL
1952	6.686	1.386	1.128	4.929	2.723	3.032	6.936	2.938	0.678	1.451	5.203	8.108	3.758
1953	3.455	1.489	1.086	5.575	3.048	2.687	5.014	2.121	0.678	2.285	7.178	5.758	3.344
1954	5.225	0.922	1.862	9.551	2.708	2.687	4.392	3.350	0.678	2.285	7.178	7.246	3.989
1955	5.706	1.325	1.731	7.084	2.702	3.286	6.691	2.922	0.678	2.285	7.178	8.108	4.124
1956	5.001	1.107	2.052	4.196	2.959	2.687	6.624	3.350	0.678	2.285	7.178	8.108	3.831
1957	4.599	1.784	1.046	7.739	2.828	2.687	8.794	3.350	0.678	2.285	7.178	7.294	4.178
1958	3.773	1.614	1.508	6.945	3.208	2.788	4.477	3.350	0.678	1.905	7.178	7.587	3.733
1959	5.666	1.263	2.275	4.755	2.761	2.687	7.423	3.350	0.678	1.462	7.178	8.108	3.946
1960	6.686	1.261	1.855	4.133	2.763	2.687	6.402	2.774	0.169	2.285	7.178	6.612	3.708
1961	4.703	0.978	1.428	8.308	2.672	2.687	5.095	3.350	0.179	2.285	7.178	7.619	3.855
1962	6.686	1.324	1.744	4.631	2.767	3.235	5.380	3.350	0.678	2.285	7.178	7.499	3.871
1963	6.104	2.153	1.357	8.049	2.973	4.361	3.755	1.755	0.678	2.285	7.178	7.426	3.987
1964	4.476	0.977	1.892	4.145	4.151	2.687	4.422	2.613	0.678	2.285	7.178	8.108	3.613
1965	6.686	1.524	1.844	9.138	3.073	3.029	4.670	1.939	0.678	2.285	7.178	8.108	4.163
1966	6.686	1.066	2.544	5.687	2.704	2.687	5.143	2.851	0.678	2.285	7.178	8.108	3.945
1967	5.118	1.076	1.730	6.048	3.755	2.687	9.357	2.702	0.678	2.285	7.178	8.108	4.215
1968	3.157	1.298	1.821	10.665	5.208	5.890	7.741	3.128	0.678	2.285	7.178	8.108	4.757
1969	6.221	1.026	2.199	7.667	2.970	5.945	8.724	2.512	0.678	2.285	7.178	6.881	4.505
1970	3.924	0.997	1.509	7.790	2.699	3.091	7.503	3.350	0.232	2.285	7.178	7.675	4.005
1971	5.981	0.981	1.519	5.047	2.703	5.798	6.687	2.902	0.678	2.285	7.178	8.108	4.132
1972	3.683	1.508	1.739	8.548	3.668	3.084	7.964	1.780	0.678	2.285	7.178	6.753	4.063
1973	6.686	1.331	1.838	5.743	2.699	2.687	8.435	2.792	0.678	2.285	7.178	7.258	4.116
1974	4.552	1.304	1.901	7.934	4.336	2.853	5.969	2.149	0.678	0.635	7.178	8.108	3.952
1975	6.141	1.344	1.173	4.948	2.691	3.599	4.000	2.294	0.260	2.285	6.626	7.587	3.557
1976	6.064	1.350	1.769	7.773	2.843	3.651	5.247	3.026	0.678	1.048	7.178	6.981	3.945
1977	4.064	1.141	2.055	6.223	2.833	2.687	6.894	3.350	0.169	1.196	5.276	8.108	3.660
1978	6.235	0.957	1.850	3.558	2.839	2.687	7.309	3.350	0.678	2.285	6.437	8.108	3.840
1979	4.790	0.991	1.627	7.608	3.633	5.216	7.697	3.350	0.678	2.285	7.178	7.166	4.335
AVERAGE	5.313	1.267	1.717	6.586	3.104	3.350	6.384	2.859	0.593	2.070	6.993	7.598	3.969

Study on Return Flow

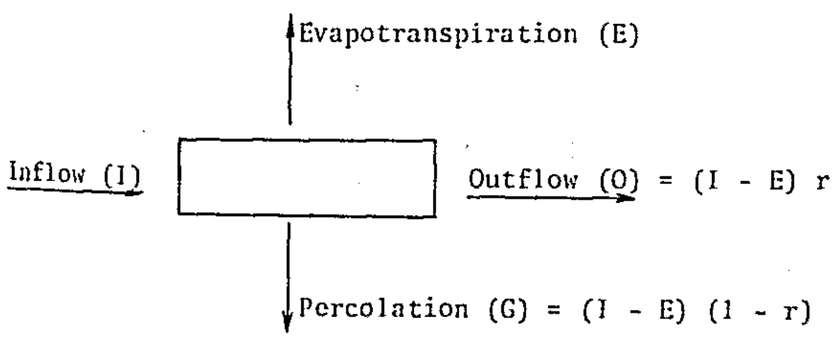
The survey of return flow in the irrigated paddy field has been carried out during the period of the Second Stage Survey started from June to August 1981, in order to find out the potential discharges to be utilized as the return flow in the downstream area.

For the purpose of the above study, the study area having the areas of about 1,090 ha has been selected at the most downstream area served by the Pha Teak main irrigation canal in the Existing Irrigated Area, as shown in Figure D 8-1. The present land categories in the area are given below;

Gross area	:	1,092 ha	
Net area	:	602	(55.1% of gross area)
Cultivate land	:	587	
Road and canal	:	15	

As shown in Figure D 8-1, the sampled area has 21 inflows, mainly diverted from the Pha Teak main canal and two outflows from the area, and each inflow and outflow discharge of these facilities has been measured simultaneously at two times on 21th to 22 th July 1981, by means of current meters, and each measurement and computation of discharges are tabulated in Table D 8-1.

The water balance, in general, in the vast irrigated area is explained in the following diagram;



and the water balance in the area is expressed as shown below, in the short periods of time, under the stabilized well-water management and no rainfall.

$$D = I - O = (G_2 - G_1) + E \text{ ---------------- (1)}$$

where; G_1 : ground water inflow

G_2 : ground water outflow

However, at the flat paddy fields in the alluvial plain such as Chiang Mai Plain, the groundwater flow is considered to be negligible small, so the above equation can be expressed as follows;

$$O = (I - E)\, r \text{ ---------------------------- (2)}$$

$$\text{so,} \quad r \text{ (return flow ratio)} = \frac{O}{I - E} \text{ ------------ (4)}$$

$$P \text{ (outflow ratio)} = \frac{O}{I} \text{ --------------- (4)}$$

Based upon the above relations, the outflow ratio (P) has been estimated by using the measured data, and the results are summarized as follows;

Item	1st Measurement	2nd Measurement
Total inflow, I (cu.m/sec)	3.631	2.100
Total outflow, O (cu.m/sec)	2.816	1.710
Outflow ratio, P (%)	77.6	81.4

Note: detail estimation is given in Table D 8-1.

As is seen in the above table, the value of outflow ratio (P) is estimated at about 80 percent on average, so that it can be expected that 24 percent of the intaked water has a potential to be utilized as irrigation water in the terms of return flow in the irrigated paddy fields, when an actual using ratio of water out of the outflow water is assumed at 30 percent in the irrigated paddy fields.

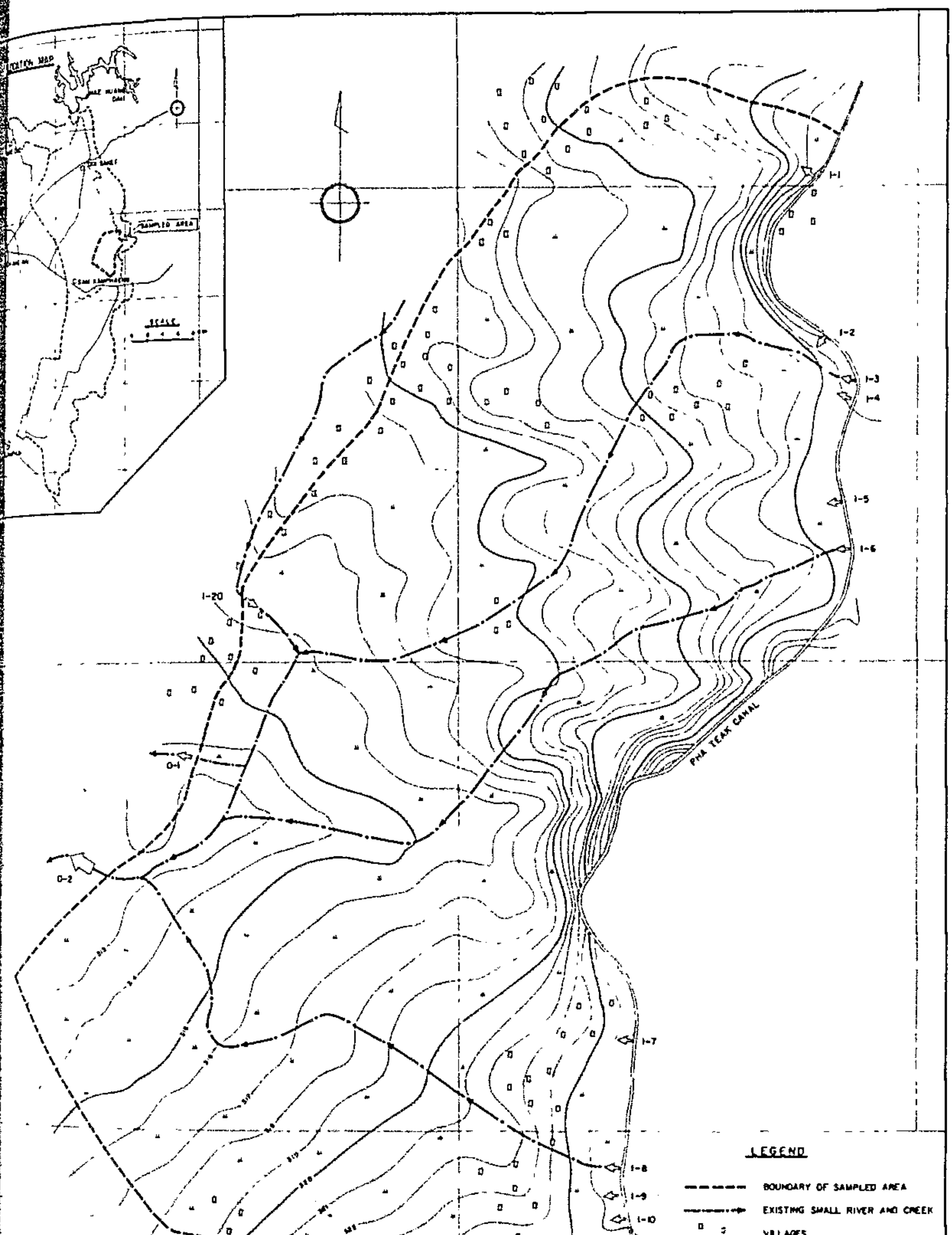
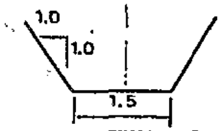
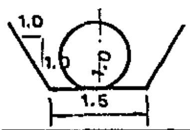
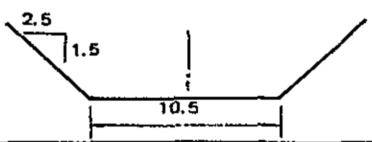
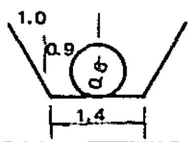
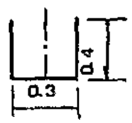
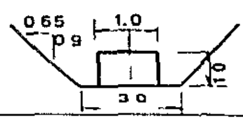
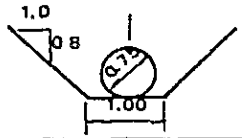
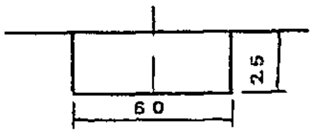
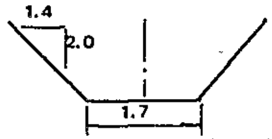
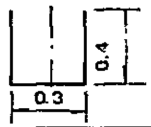
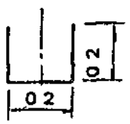
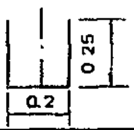


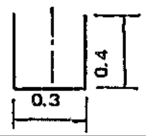
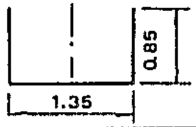
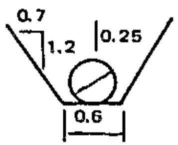
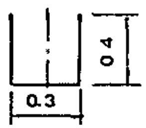
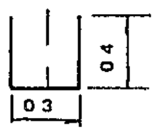
FIGURE D8-1
SAMPLED AREA FOR MEASUREMENT OF RETURN FLOW

Table D 8-1 Calculation of Canal Discharge

I: Inflow
O: Outflow

No.	Station	Canal Cross Section	Canal Cross Sectional Area: Water Depth (H) (m)	Canal Cross Sectional Area: Area (A) (m^2)	Velocity (V) (m/sec)	Canal Discharge (Q) (cu.m/sec)	Remarks
I-1	No.8 (19 + 300)		h = 0.39	0.23	0.36	0.083	Intake Canal
			h = 0.30	0.17	0.32	0.054	
I-2	(20 + 750)		h = 0	0	0	0	Intake Canal
			h = 0	0	0	0	
I-3	(20 + 800)		h = 0.35	0.21	1.41	0.296	Small river
			h = 0.20	0.09	1.17	0.105	(under bridge)
I-4	No.9 (20 + 850)		h = 0	0	0	0	Intake Canal
			h = 0	0	0	0	
I-5			h = 0.39	0.12	0.13	0.016	Flume
			h = 0.10	0.03	0.10	0.003	
I-6	(21 + 400)		h = 0.31	0.31	1.22	0.378	Intake Canal
			h = 0.19	0.19	0.94	0.179	

No.	Station	Canal Cross Section	Canal Cross Sectional Area: Water Depth (H) (m)	Canal Cross Sectional Area: Area (A) (m^2)	Velocity (V) (m/sec)	Canal Discharge (Q) (cu.m/sec)	Remarks
I-7	No.10 (24 + 50)		h = 0.40	0.24	0.19	0.046	Intake canal
			h = 0	0	0	0	
I-8			h=0.10 - 0.50	0.33	0.24	0.079	Small river
			h=0.07 - 0.40	0.30	0.18	0.054	(under bridge)
I-9	No.11 (24 + 500)		h = 0	0	0	0	Intake canal
			h = 0	0	0	0	
I-10			h = 0.10	0.03	0.30	0.009	Flume
			h = 0.11	0.03	0.27	0.008	
I-11			h = 0.10	0.02	0.25	0.005	Flume
			h = 0.05	0.01	0.09	0.001	
I-12			h = 0.06	0.01	0.67	0.067	Flume
			h = 0.07	0.01	0.51	0.051	

No.	Station	Canal Cross Section	Canal Cross Sectional Area		Velocity (V) (m/sec)	Canal Discharge(Q) (cu.m/sec)	Remarks
			Water Depth(H) (m)	Area (A) (m^2)			
I-13			h = 0.18	0.05	0.88	0.044	Flume
			h = 0	0	0	0	
I-14			h = 0.34	0.46	3.17	1.460	Flume
			h = 0.27	0.36	2.61	0.940	
I-15			h = 0	0	0	0	Intake canal
			h = 0	0	0	0	
I-16			h = 0.16	0.05	0.68	0.034	Flume
			h = 0.12	0.04	0.49	0.020	
I-17			h = 0.14	0.042	0.76	0.032	Flume
			h = 0.12	0.036	0.32	0.012	
I-18			h = 0.40	0.34	1.78	0.605	Flume
			h = 0.44	0.37	1.11	0.411	

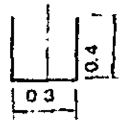
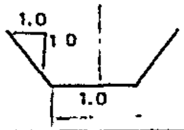
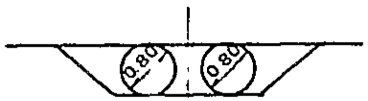
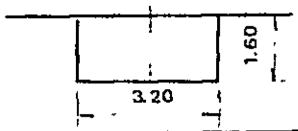
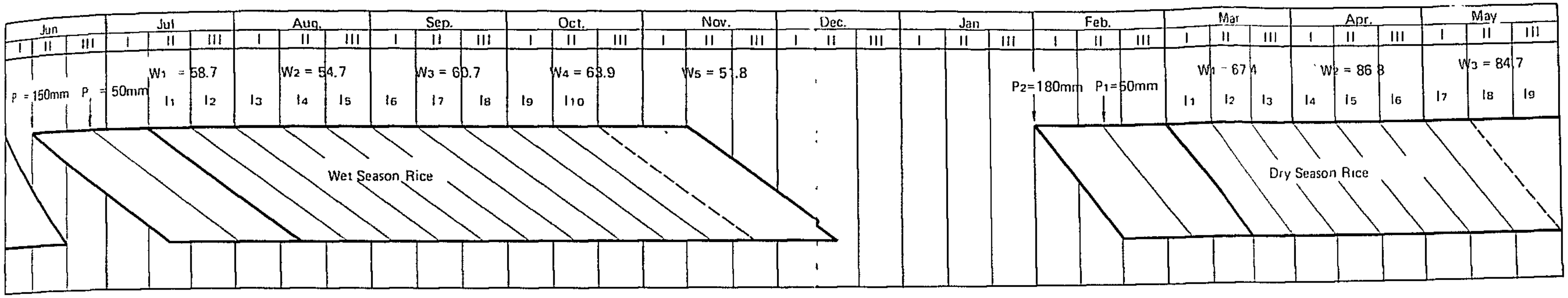
No.	Station	Canal Cross Section	Canal Cross Sectional Area: Water Depth (H) (m)	Area (A) (m^2)	Velocity (V) (m/sec)	Canal Discharge (Q) (cu.m/sec)	Remarks
I-19			h = 0.25	0.08	0.34	0.027	Flume
			h = 0.14	0.04	0.30	0.012	
I-20			h = 0.62	1.00	0.45	0.450	Irrigation canal
			h = 0.45	0.65	0.38	0.250	
O-1			h = 0.20	0.10	1.14	0.114	Irrigation canal
			h = 0.18	0.08	1.02	0.082	
O-2			h = 1.43	4.58	0.59	2.702	Drainage canal
			h = 1.24	3.97	0.41	1.628	
		Total	1st measurement: ΣQ_I = 3.631 cu.m/sec, ΣQ_O = 2.816 cu.m/sec				
			2nd measurement: ΣQ_I = 2.100 cu.m/sec, ΣQ_O = 1.710 cu.m/sec				

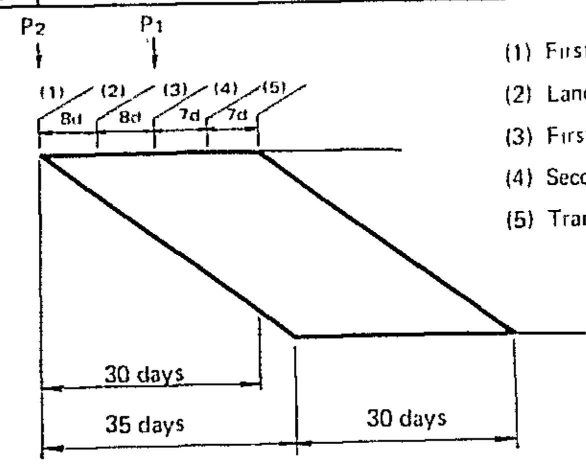
FIGURE D 9-1 CALCULATION OF CROP WATER REQUIREMENT FOR PADDY RICE



Month		Wet Season Rice: Equation for 10-day Weighted Irrigation Water Requirement		(mm/day)
June	I			
	II	$W_r = P_2 \times 10/35$	$= P_2 \times 10/35$	4.28
	III	$W_r = P_2 \times 10/35 + P_1 \times 4/35$	$= (10P_2 + 4P_1)/35$	4.86
July	I	$W_r = P_2 \times 10/35 + P_1 \times 10/35$	$= (P_2 + P_1)\ 10/35$	5 71
	II	$W_r = P_2 \times 5/35 + P_1 \times 10/35 + I_1 \times 10/351$	$= (5P_2 + 10P_1 + 10W_1)/35$	5 25
	III	$W_r = P_1 \times 11/35 + I_1 \times 11/35 + I_2 \times 11/35$	$= (11P_1 + 22W_1)/35$	5.26
August	I	$W_r = I_1 \times 10/35 + I_2 \times 10/35 + I_3 \times 10/35$	$= (20W_1 + 10W_2)/35$	4.92
	II	$W_r = I_1 \times 4/35 + I_2 \times 10/35 + I_3 \times 10/35 + I_4 \times 10/35$	$= (14W_1 + 20W_2)/35$	5.47
	III	$W_r = I_2 \times 4/35 + I_3 \times 11/35 + I_4 \times 11/35 + I_5 \times 11/35$	$= (4W_1 + 33W_2)/35$	5 83
September	I	$W_r = I_3 \times 4/35 + I_4 \times 10/35 + I_5 \times 10/35 + I_6 \times 10/35$	$= (24W_2 + 10W_3)/35$	5 49
	II	$W_r = I_4 \times 4/35 + I_5 \times 10/35 + I_6 \times 10/35 + I_7 \times 10/35$	$= (14W_2 + 20W_3)/35$	5.66
	III	$W_r = I_5 \times 4/35 + I_6 \times 10/35 + I_7 \times 10/35 + I_8 \times 10/35$	$= (4W_2 + 30W_3)/35$	5.83
October	I	$W_r = I_6 \times 4/35 + I_7 \times 10/35 + I_8 \times 10/35 + I_9 \times 10/35$	$= (24W_3 + 10W_4)/35$	5.99
	II	$W_r = I_7 \times 4/35 + I_8 \times 10/35 + I_9 \times 10/35 + I_{10} \times 10/35$	$= (14W_3 + 20W_4)/35$	6.08
	III	$W_r = I_8 \times 4/35 + I_9 \times 11/35 + I_{10} \times 11/35$	$= (4W_3 + 22W_4)/35$	4.71
November	I	$W_r = I_9 \times 4/35 + I_{10} \times 10/35$	$= (14W_4)/35$	2.56
	II	$W_r = I_{10} \times 4/35$	$= 4W_4/35$	0 73
	III			
December	I			
	II			
	III			

Month		Dry Season Rice: Equation for 10-day Weighted Irrigation Water REquirement		(mm/day)
February	I	$W_r = P_2 \times 10/20$	$= P_2 \times 10/20$	9.00
	II	$W_r = P_2 \times 10/20 + P_1 \times 4/20$	$= (10P_2 + 4P_1)/20$	10 00
	III	$W_r = P_1 \times 8/20$	$= 8P_1\ 20$	2.00
March	I	$W_r = P_1 \times 8/20 + I_1 \times 10/20$	$= (8P_1 + 10W_1)/20$	5.37
	II	$W_r = I_1 \times 10/20 + I_2 \times 10/20$	$= (20W_1)/20$	6 74
	III	$W_r = I_2 \times 10/20 + I_3 \times 11/20$	$= 21W_1/20$	7.08
April	I	$W_r = I_3 \times 9/20 + I_4 \times 10/20$	$= (9W_1 + 10W_2)/20$	7.37
	II	$W_r = I_4 \times 10/20 + I_5 \times 10/20$	$= 20W_2/20$	8.68
	III	$W_r = I_5 \times 10/20 + I_6 \times 10/20$	$= 20W_2/20$	8 68
May	I	$W_r = I_6 \times 10/20 + I_7 \times 10/20$	$= (10W_2 + 10W_3)/20$	8 58
	II	$W_r = I_7 \times 10/20$	$= 10W_3/20$	4.24
	III			
June	I			
	II			
	III			

Note: P; Additional water supply for land soaking and land preparation (mm)
W; Water requirement (mm/10-day)



(1) First irrigation for land soaking
(2) Land Plowing
(3) First harrowing and second irrigation
(4) Second harrowing
(5) Transplanting

ILLUSTRATION OF WORKING SCHEDULE FOR LAND SOAKING AND PREPARATION

Table D 10-1 Net Amount of Water to be Replaced for Crops (Corn, Groundnuts) -Existing Irrigated Area and High and Downstream Area-

(1) Depth (cm)	(2) Available Moisture[1/] (AM) (mm)	(3) Ratio of Moisture Extraction	(4) (2)/(3) (mm)	(5) Restricting Layer of Moisture	(6) TRAM[2/] (mm)	(7) Net Amount of Water to be Replaced (mm)
0 - 12.5	28.5	0.4	71.3	*	71.3	71.3
12.5 - 25.0	29.2	0.3	97.3			
25.0 - 37.5	31.4	0.2	157.0			
37.5 - 50.0	33.7	0.1	337.0			

Note: 1/: $AM = \frac{1}{100}(Fc - Wp) \cdot Sa \cdot D$

Fc: Field Capacity (%)

Wp: Wilting Point (%)

Sa: Aparent Specific Gravity (g/cm^3)

D: Depth (mm)

2/: TRAM: Total Readily Available Moisture

Table D 10-2 Net Amount of Water to be Replaced for Crops (Garlic, Vegetable, Soybeans) -Existing Irrigated Area and Hihg and Downstream Area-

(1) Depth (cm)	(2) Available 1/ Moisture (AM) (mm)	(3) Ratio of Moisture Extraction	(4) (2)/(3) (mm)	(5) Restricting Layer of Moisture	(6) TRAM 2/ (mm)	(7) Net Amount of Water to be Replaced (mm)
0 - 10	22.8	0.4	57.0	*	57.0	57.0
10 - 20	23.4	0.3	78.0			
20 - 30	24.6	0.2	123.0			
30 - 40	25.1	0.1	251.0			

Note: 1/: $AM = \frac{1}{100} (Fc - Wp) \cdot Sa \cdot D$

Fc: Field Capacity (%)

Wp: Wilting Point (%)

Sa: Aparent Specific Gravity (g/cm^3)

D: Depth (mm)

2/: TRAM: Total Readily Available Moisture

Table D 10-3 Net Amount of Water to be Replaced for Crops (Tobacco) -Existing Irrigated Area and High and Downstream Area-

(1) Depth (cm)	(2) Available[1/] Moisture (AM) (mm)	(3) Ratio of Moisture Extraction	(4) (2)/(3) (mm)	(5) Restricting Layer of Moisture	(6) TRAM[2/] (mm)	(7) Net Amount of Water to be Replaced (mm)
0 - 15	34.6	0.4	86.5	*	86.5	86.5
15 - 30	36.0	0.3	120.0			
30 - 45	37.3	0.2	186.5			
45 - 60	39.1	0.1	391.0			

Note: 1/: $AM = \frac{1}{100} (Fc - Wp) \cdot Sa \cdot D$

Fc: Field Capacity (%)

Wp: Wilting Point (%)

Sa: Aparent Specific Gravity (g/cm^3)

D: Depth (mm)

2/: TRAM: Total Readily Available Moisture

Table D 10-4 Net Amount of Water to be Replaced for Crops (Tobacco)
-Right Bank Area-

(1) Depth (cm)	(2) Available Moisture (AM)[1/] (mm)	(3) Ratio of Moisture Extraction	(4) (2)/(3) (mm)	(5) Restricting Layer of Moisture	(6) TRAM[2/] (mm)	(7) Net Amount of Water to be Replaced (mm)
0 - 12.5	13.1	0.4	32.8	*	32.8	32.8
12.5 - 25.0	13.1	0.3	43.7			
25.0 - 37.5	12.1	0.2	60.5			
37.5 - 50.0	11.3	0.1	113.0			

Note: 1/: $AM = \frac{1}{100} (Fc - Wp) \cdot Sa \cdot D$

Fc: Field Capacity (%)

Wp: Wilting Point (%)

Sa: Apparent Specific Gravity (g/cm^3)

D: Depth (mm)

2/: TRAM: Total Readily Available Moisture

Table D 10-5 Net Amount of Water to be Replaced for Crops (Garlic, Vegetable, Soybeans) -Right Bank Area-

(1) Depth (cm)	(2) Available Moisture (AM)1/ (mm)	(3) Ratio of Moisture Extraction	(4) (2)/(3) (mm)	(5) Restricting Layer of Moisture	(6) TRAM2/ (mm)	(7) Net Amount of Water to be Replaced (mm)
0 - 10	10.5	0.4	26.3	*	26.3	26.3
10 - 20	10.5	0.3	35.0			
20 - 30	9.7	0.2	48.5			
30 - 40	9.0	0.1	90.0			

Note: 1/: $AM = \frac{1}{100} (Fc - Wp) \cdot Sa \cdot D$

Fc: Field Capacity (%)

Wp: Wilting Point (%)

Sa: Aparent Specific Gravity (g/cm^3)

D: Depth (mm)

2/: TRAM: Total Readily Available Moisture

Table D 10-6 Net Amount of Water to be Replaced for Crops (Corn, Groundnuts)
-Right Bank Area-

(1) Depth (cm)	(2) Available 1/ Moisture (AM) (mm)	(3) Ratio of Moisture Extraction	(4) (2)/(3) (mm)	(5) Restricting Layer of Moisture	(6) TRAM 2/ (mm)	(7) Net Amount of Water to be Replaced (mm)
0 - 12.5	13.1	0.4	32.8	*	32.8	32.8
12.5 - 25.0	13.1	0.3	43.7			
25.0 - 37.5	11.6	0.2	58.0			
37.5 - 50.0	11.3	0.1	113.0			

Note: 1/: $AM = \frac{1}{100} (Fc - Wp) \cdot Sa \cdot D$

Fc: Field Capacity (%)

Wp: Wilting Point (%)

Sa: Aparent Specific Gravity (g/cm^3)

D: Depth (mm)

2/: TRAM: Total Readily Available Moisture

Table D 10-7 Physical Features of Soil (Existing Irrigated Area and Hing and Downstream Area)

Location	Condition	Soil Depth (cm)	Real Specific Gravity (Sr) (g/cm³)	Aparent Specific Gravity (Sa) (g/cm³)	Prosity (P)1/ (%)	Field Capacity (Fc) (%)	Wilting2/ point (Wp) (%)
No.1, Ban Luang Nua	Dry Condition	10	2.58	1.12	56.6	38.5	18.6
		20	2.61	1.20	54.0	34.0	16.2
		30	2.62	1.08	58.8	34.8	16.6
		40	2.62	1.07	59.2	31.8	15.1
		50	2.65	1.11	58.1	30.1	14.2
	Wet Condition	10	2.59	1.34	48.3	36.8	17.7
		20	2.64	1.37	48.1	32.4	15.4
		30	2.61	1.45	44.4	30.2	14.3
		40	2.64	1.45	45.1	30.0	14.2
		50	2.63	1.43	45.6	32.6	15.5
No.2, Ban Mae Pong	Dry Condition	10	2.67	1.14	57.3	37.0	17.8
		20	2.69	1.12	58.4	37.8	18.2
		30	2.70	1.21	55.2	38.1	18.3
		40	2.71	1.33	50.9	37.2	17.9
		50	2.72	1.32	51.5	37.1	17.8
	Wet Condition	10	2.66	1.10	58.6	37.4	18.0
		20	2.67	1.17	56.2	37.5	18.0
		30	2.71	1.33	50.9	36.3	17.4
		40	2.72	1.35	50.4	37.1	17.8
		50	2.73	1.37	49.8	38.7	18.7
No.3, Ban Huai Sai Nua	Dry Condition	10	2.62	1.40	46.6	27.7	13.0
		20	2.70	1.49	44.8	34.7	16.6
		30	2.70	1.37	49.3	38.7	18.7
		40	2.72	1.32	51.5	40.5	19.6
		50	2.72	1.36	50.0	42.2	20.5
	Wet Condition	10	2.63	1.43	45.6	27.5	12.9
		20	2.68	1.63	39.2	25.9	12.0
		30	2.68	1.43	46.6	34.5	16.5
		40	2.69	1.42	47.2	35.1	16.8
		50	2.69	1.38	48.7	40.5	19.6
Average (Wet Conditions)		10	2.63	1.29	50.8	33.9	16.2
		20	2.66	1.39	47.8	31.9	15.1
		30	2.67	1.40	47.3	33.7	16.1
		40	2.68	1.41	47.6	34.1	16.3
		50	2.68	1.39	48.0	37.3	17.9

Note: 1/ $P = (Sr - Sa) \times 100/Sr$ (%)

2/ $Wp = 0.36\ Fc^{1.08}$

Table D 10-8 Physical Features of Soil (Right Bank Area)

Location	Condition	Soil Depth (cm)	Real Specific Gravity (Sr) (g/cm³)	Aparent Specific Gravity (Sa) (g/cm³)	Prosity (P)[1/] (%)	Field Capacity (Fc) (%)	Willing[2/] point (Wp) (%)
No.4, Ban Huai Som	Dry Condition	10	2.62	1.54	41.2	12.6	5.55
		20	2.63	1.51	42.6	11.8	5.17
		30	2.62	1.49	43.1	11.4	4.99
		40	2.62	1.52	42.0	11.0	4.80
		50	2.68	1.56	41.8	11.6	5.08
	Wet Condition	10	2.62	1.51	42.3	10.1	4.37
		20	2.63	1.57	40.3	10.3	4.47
		30	2.60	1.57	39.6	10.3	4.47
		40	2.61	1.55	40.6	9.6	4.14
		50	2.65	1.56	41.1	10.8	4.70
No.5, Ban Phae	Dry Condition	10	2.61	1.32	49.4	13.1	5.79
		20	2.62	1.40	46.6	14.3	6.37
		30	2.68	1.41	47.4	13.5	5.98
		40	2.62	1.48	43.5	11.6	5.08
		50	2.59	1.53	40.9	10.3	4.47
	Wet Condition	10	2.56	1.50	41.4	14.6	6.51
		20	2.58	1.48	42.6	14.0	6.22
		30	2.59	1.47	43.2	12.3	5.41
		40	2.59	1.51	41.7	11.4	4.99
		50	2.62	1.53	41.6	9.8	4.23
Average	Wet Condition	10	2.59	1.51	41.9	12.4	5.44
		20	2.61	1.53	41.5	12.2	5.35
		30	2.60	1.52	41.4	11.3	4.94
		40	2.60	1.51	41.2	10.5	4.57
		50	2.64	1.55	41.4	10.3	4.47

Note: 1/ P = (Sr - Sa) x 100/Sr (%)   2/ Wp = 0.36 Fc[illegible]

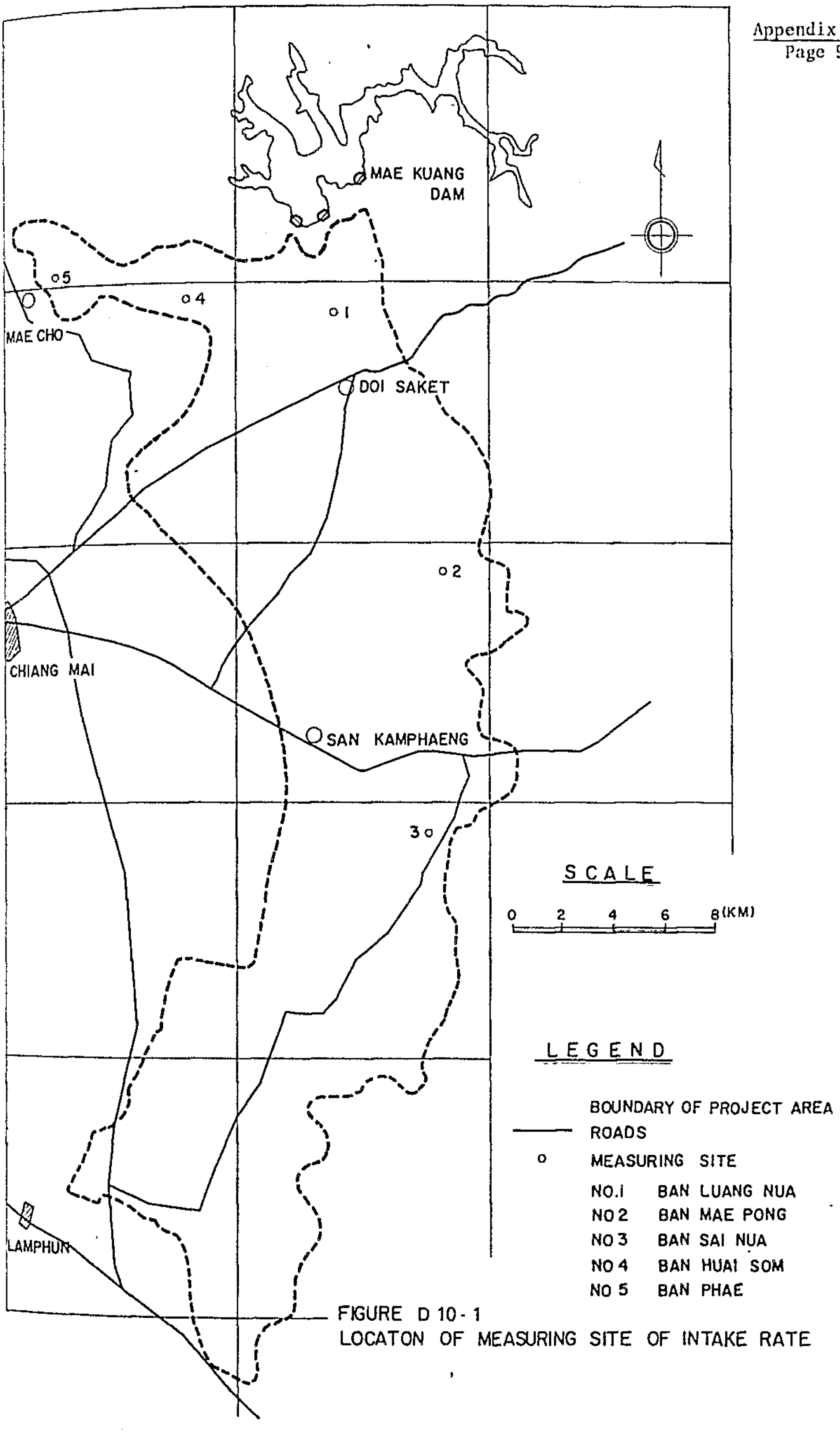
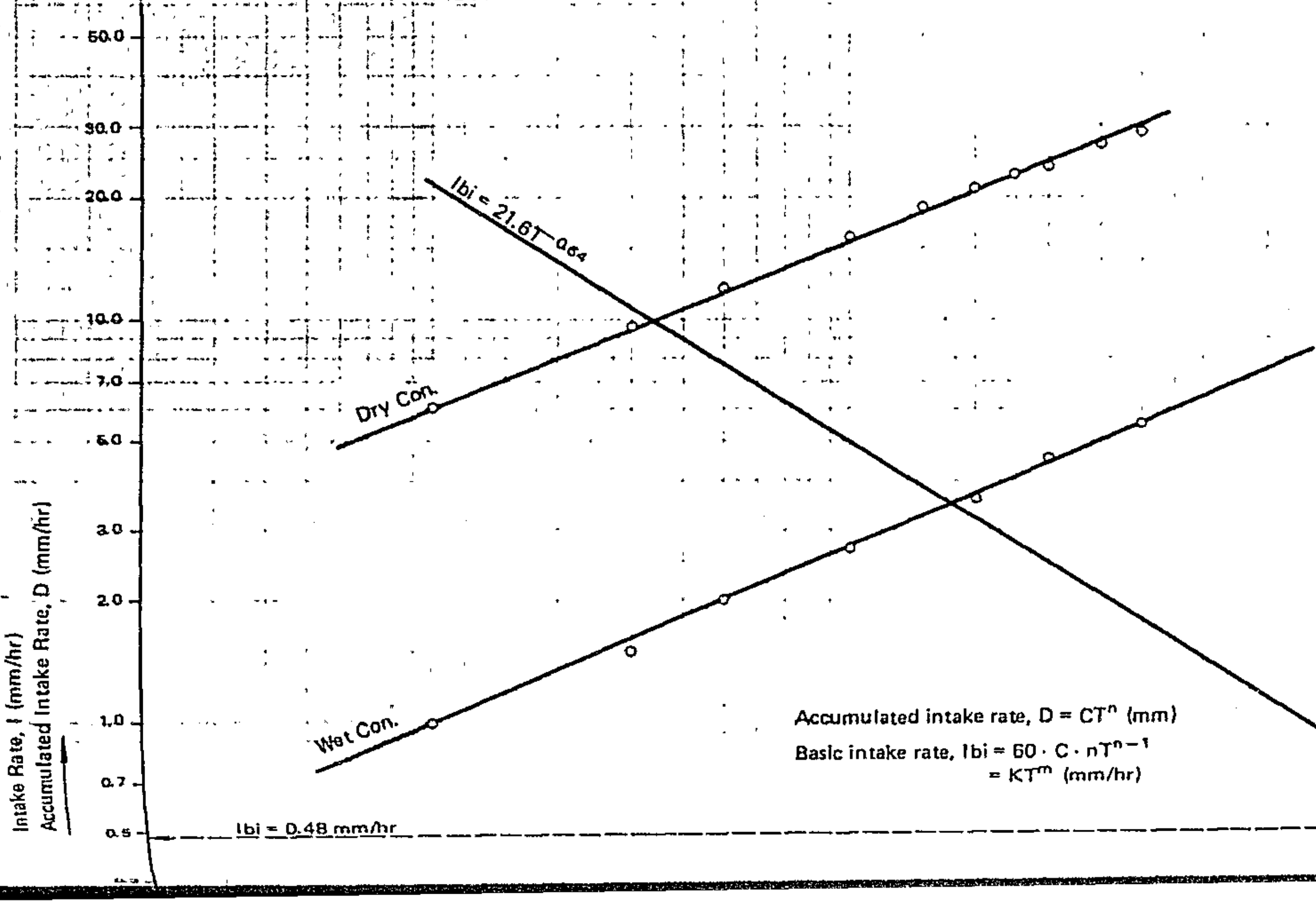


FIGURE D 10-1
LOCATON OF MEASURING SITE OF INTAKE RATE

FIBURE D 10-2 RESULT OF CYLINDER INTAKE RATE (NO.1, BAN LUANG NUA)



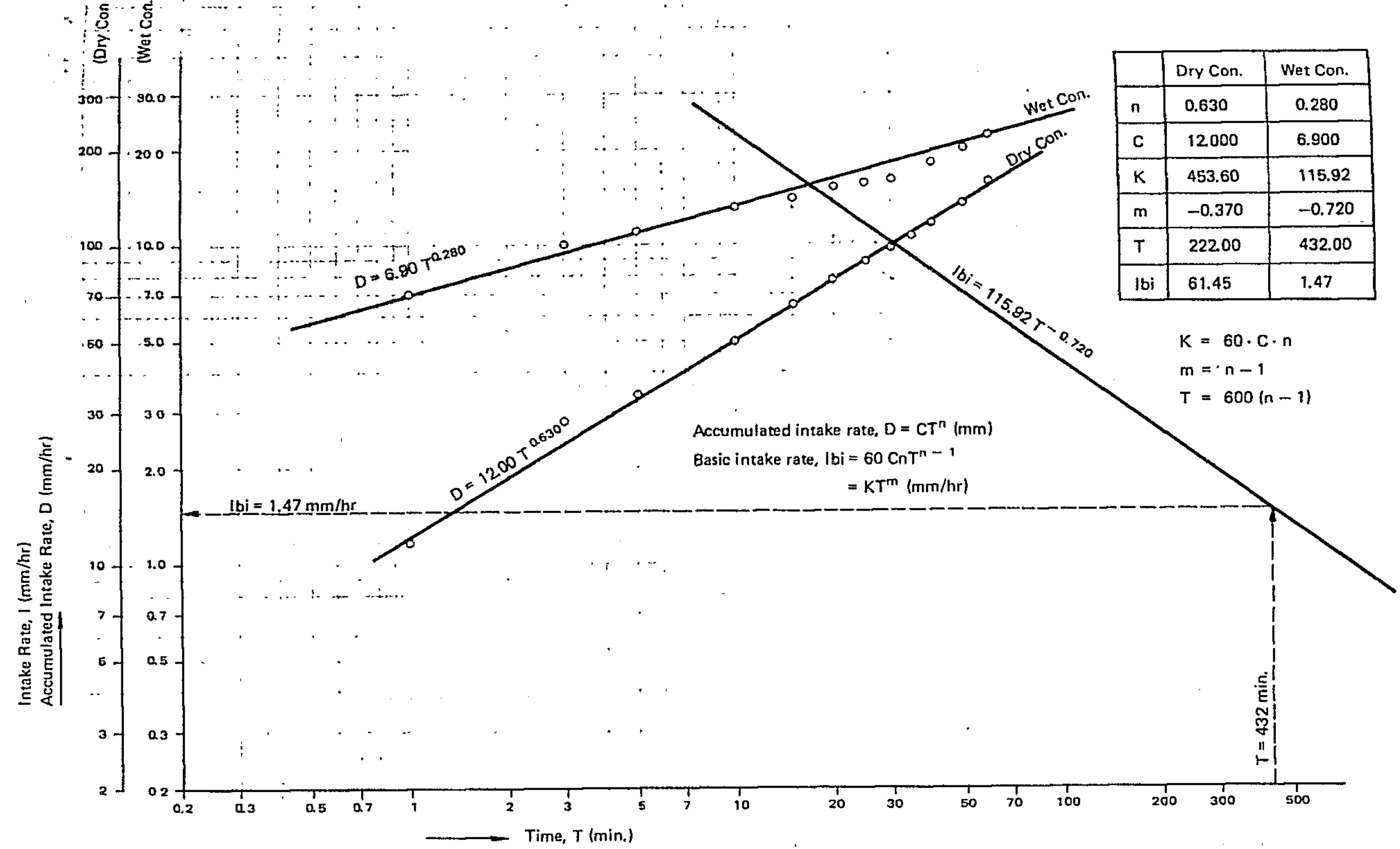
	Dry Con.	Wet Con.
n	0.439	0.360
C	6.020	1.000
K	158.57	21.600
m	−0.561	−0.640
T	336.60	384.00
Ibi	6.06	0.48

$K = 60 \cdot C \cdot n$

$m = n - 1$

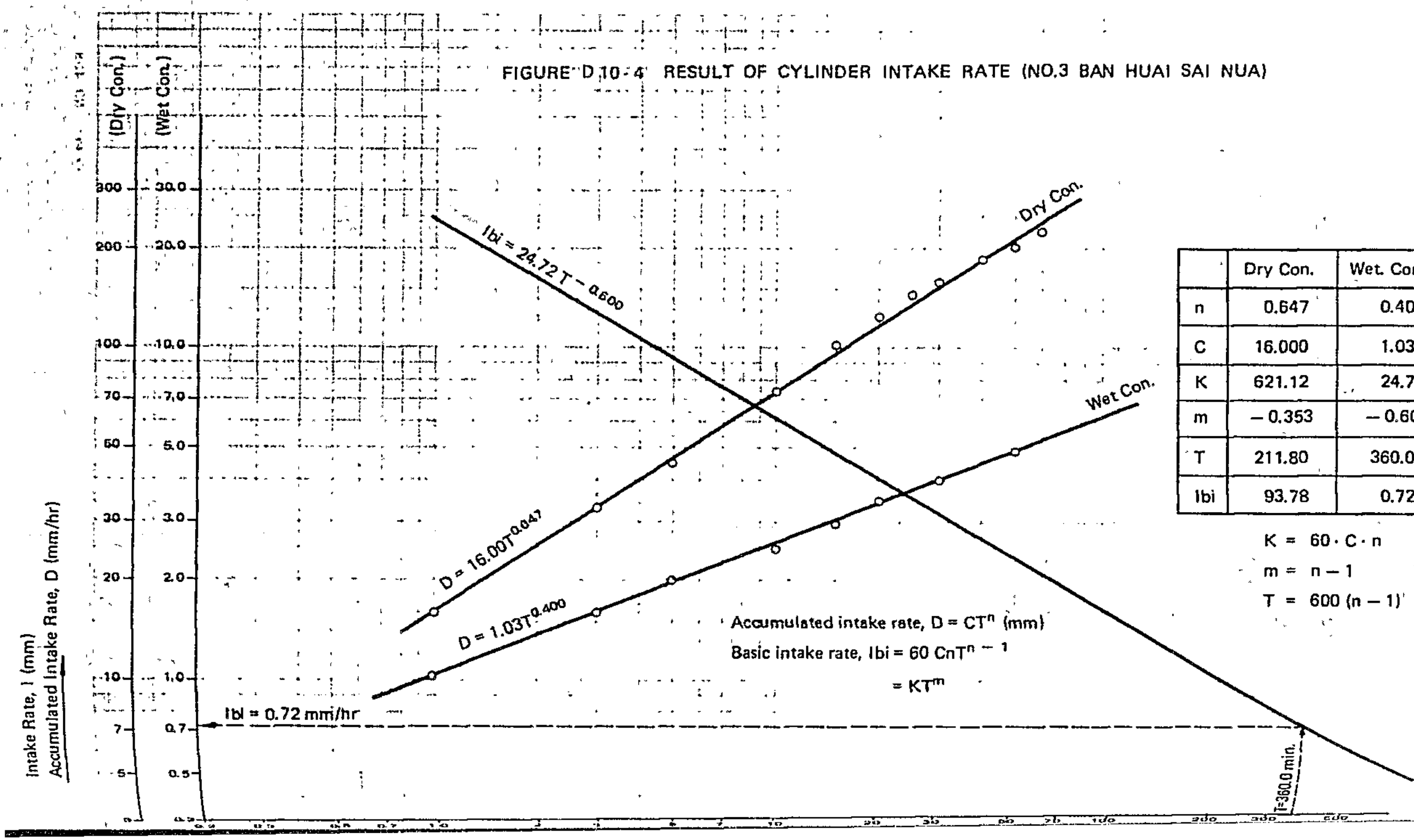
$T = 600 (n - 1)$

FIGURE D 10-3 RESULT OF CYLINDER INTAKE RATE (NO.2 BAN MAE PONG)



	Dry Con.	Wet Con.
n	0.630	0.280
C	12.000	6.900
K	453.60	115.92
m	−0.370	−0.720
T	222.00	432.00
Ibi	61.45	1.47

FIGURE D.10-4 RESULT OF CYLINDER INTAKE RATE (NO.3 BAN HUAI SAI NUA)



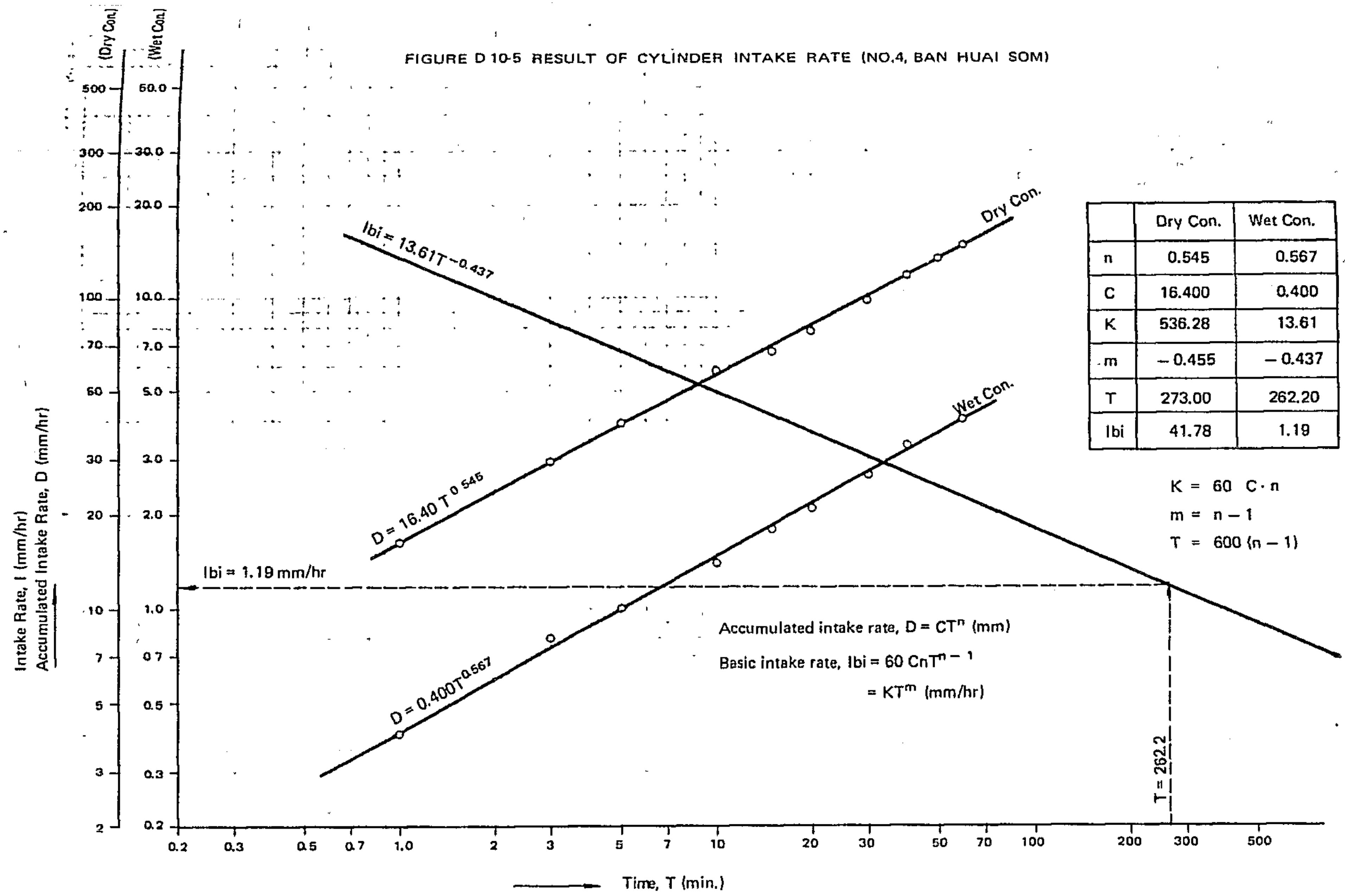
	Dry Con.	Wet Con.
n	0.647	0.400
C	16.000	1.030
K	621.12	24.72
m	− 0.353	− 0.600
T	211.80	360.00
Ibi	93.78	0.72

$K = 60 \cdot C \cdot n$

$m = n - 1$

$T = 600\,(n - 1)$

FIGURE D 10-5 RESULT OF CYLINDER INTAKE RATE (NO.4, BAN HUAI SOM)



	Dry Con.	Wet Con.
n	0.545	0.567
C	16.400	0.400
K	536.28	13.61
m	− 0.455	− 0.437
T	273.00	262.20
Ibi	41.78	1.19

$K = 60 \ C \cdot n$

$m = n - 1$

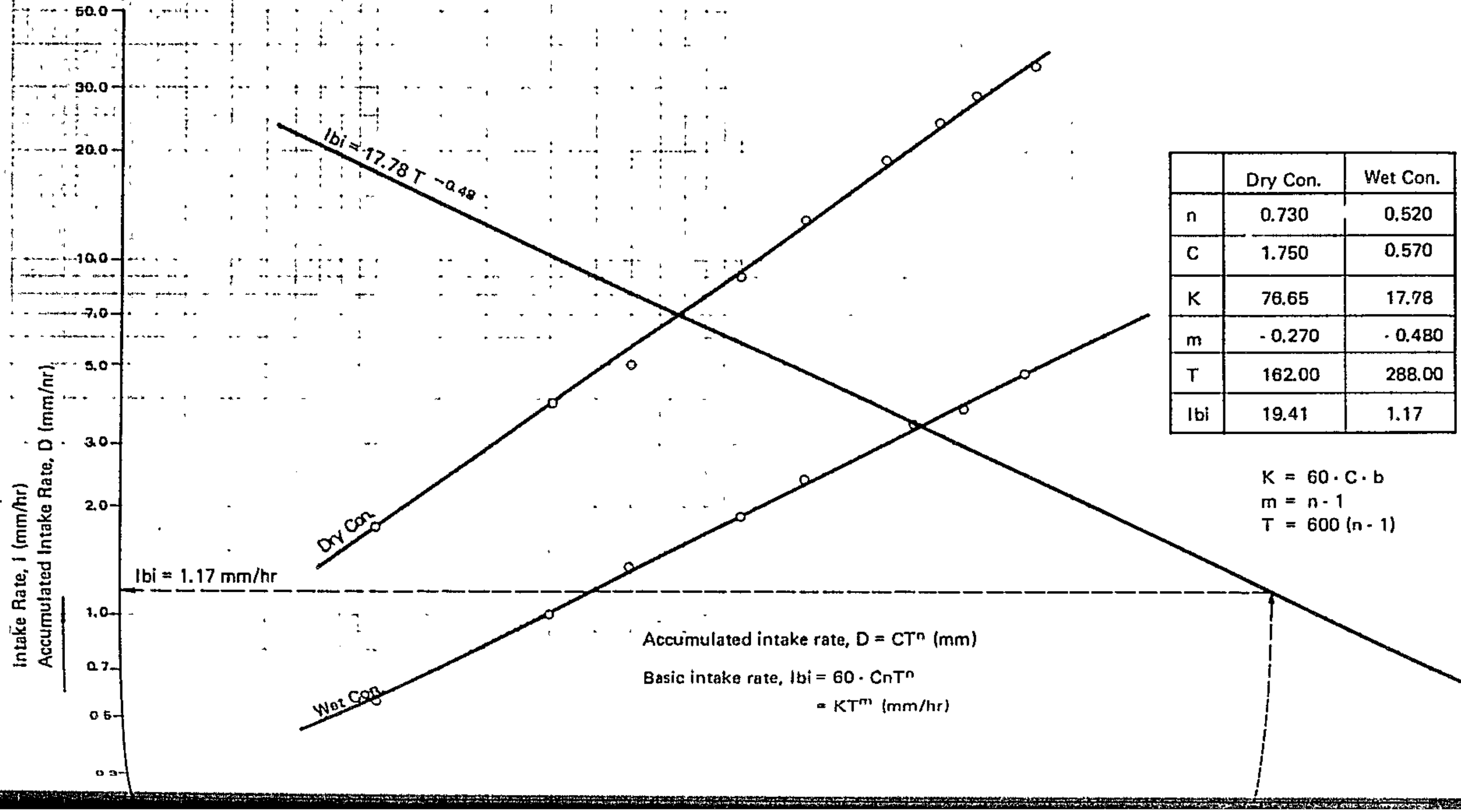
$T = 600 \ (n - 1)$

Accumulated intake rate, $D = CT^n$ (mm)

Basic intake rate, $Ibi = 60 \ CnT^{n-1}$

$= KT^m$ (mm/hr)

FIGURE D 10-6 RESULT OF CYLINDER INTAKE RATE (NO.5, BAN PHAE)



	Dry Con.	Wet Con.
n	0.730	0.520
C	1.750	0.570
K	76.65	17.78
m	- 0.270	- 0.480
T	162.00	288.00
Ibi	19.41	1.17

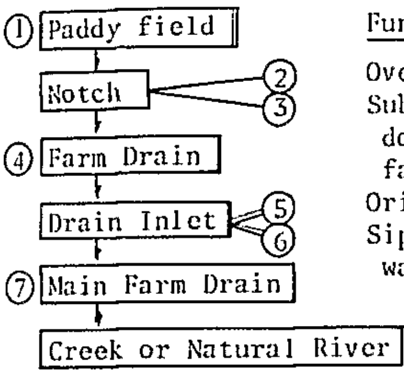
$K = 60 \cdot C \cdot b$

$m = n - 1$

$T = 600 (n - 1)$

Run-off Mechanism of Paddy Fields

Normally, paddy field has a function of storage of rainfall. The stored water in the paddy field is discharged through a notches provided at each plot to a terminal drainage canal of farm drain. The farm drain is connected to a main farm drain by drain inlet which is facilitated by means of pipes. The notch can control the drainage discharge from the Paddy fields, and the drain inlet at the end of farm drain can control the discharge to the main farm drain. Considering these drainage mechanism, the drainage system can be illustrated as below and Figure D 11-1.



Function of Stroage

② Over flow
③ Submerged condition - affected by downstream water level of the farm drain
⑤ Orifice
⑥ Siphone - affected by downstream water level of the main farm drain

In the above drainage mechanism in the paddy fields, the most critical capacity is caused by the notch under the over flow condition and the drain inlet in syphone conditions which are affected by the water level in the main farm drain.

In a given time interval, the difference between inflow and outflow is equal to the change in storage of the Paddy fields;

$$I - O = \Delta S$$

or if expressed in definite time intervals,

$$1/2(I_1 + I_2)\Delta t - 1/2(O_1 + O_2)\Delta t = S_2 - S_1$$

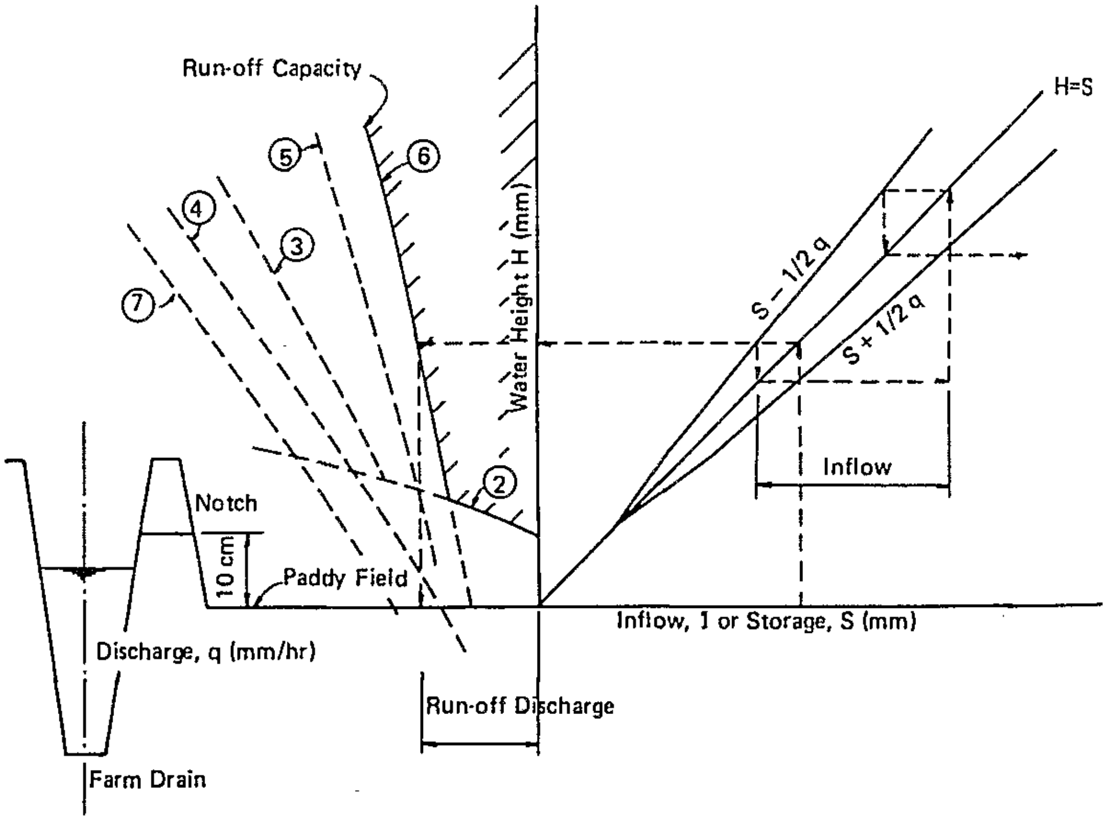
$$1/2(I_1 + I_2)\Delta t = (S_2 - S_1) + 1/2(O_2 + O_1)\Delta t$$

$$= (S_2 + \tfrac{1}{2}O_2\Delta t) - (S_1 - \tfrac{1}{2}O_1)\Delta t$$

where, the subscripts indicate the routing periods of paddy storage, and I, O, and S are instantaneous values of inflow, outflow, and storage respectively, at the beginning of the routing periods indicated. In the case of unit area of paddy fields, the storage, S should be equal to water depth, H and unit time, t equals to one (1) hour, inflow, I equals to hourly rainfall (mm/hr) and the outflow, O equals to discharge from paddy field, q (mm/hr) which are considered as run-off capacity controled by notches and drain inlets mentioned previously.

From the above equations, the following figure can be drawn to estimate the q and S by using the obtained hourly rainfall.

FIGURE D 11-1 ILLUSTRATION OF RUN-OFF MECHANISM OF PADDY FIELD



According to the field survey, the average height of farm dike is 30 cm, and the size of notch is 30 cm width and 20 cm depth located at 10 cm height above field surface.

Run-off discharge in the Paddy field was calculated by applying the above mentioned procedures. Figure D 11-2 indicates run-off capacity controled by notches and drain inlets provided in fields, and the diagram of run-off routing by using the obtained run-off capacity and design rainfall is shown in Figure D 11-3.

As the results of studies on the run-off discharge, the maximum run-off discharge, which is caused by the maximum spot one day rainfall of 108 mm, corresponding to the return period of 5-year, is estimated at 1.102 cu.m/sec/100ha, equivalent to 95.2 mm/24 hr. Table D 11-1 and Figure D 11-3 show the result of these studies.

Table D 11-1 Results of Run-off Routing in Paddy Fields

Time	Hourly Rainfall (mm)	Water Depth in Paddy Field (mm)	Run-off Discharge (mm)	Run-off Discharge (cu.m/sec/100ha)	Time	Hourly Rainfall (mm)	Water Depth in Paddy Field (mm)	Run-off Discharge (mm)	Run-off Discharge (cu.m/sec/100ha)
1	1.3	100.9	0.45	0.135 1/	1	-	147.0	3.89	1.091
2	1.3	101.6	0.70	0.204	2	-	143.2	3.88	1.088
3	1.4	102.0	0.98	0.282	3	-	139.5	3.86	1.082
4	1.4	102.2	1.15	0.329	4	-	135.7	3.84	1.077
5	1.5	102.4	1.22	0.349	5	-	131.9	3.81	1.068
6	1.6	102.7	1.28	0.366	6	-	128.0	3.80	1.066
7	1.7	102.8	1.35	0.385	7	-	124.3	3.78	1.060
8	1.7	103.0	1.38	0.393	8	-	120.6	3.77	1.057
9	1.8	103.1	1.39	0.396	9	-	116.8	3.76	1.054
10	1.9	103.3	1.41	0.402	10	-	109.3	3.74	1.049
11	1.9	103.4	1.43	0.407	11	-	105.8	2.80	0.787
12	2.0	103.6	1.48	0.421	12	-	103.3	1.43	0.407
13	2.7	104.2	1.90	0.538	13	-	101.9	0.98	0.282
14	2.9	104.7	2.20	0.621	14	-	101.1	0.70	0.204
15	3.3	105.3	2.50	0.704	15	-	100.6	0.50	0.149
16	6.6	108.7	3.69	1.035	16	-	100.3	0.30	0.093
17	9.4	114.3	3.75	1.052					
18	43.4	153.6	3.90	1.093					
19	4.2	155.0	3.92	1.099					
20	3.7	155.4	3.93	1.102					
21	3.2	155.2	3.92	1.098					
22	2.5	153.9	3.91	1.096					
23	2.4	152.5	3.91	1.096					
24	2.2	150.8	3.90	1.093					

Note: 1/: inclusive of the following base flow;

$$\frac{(4.4mm + 1.5mm) \times 10^{-3} \times 100ha \times 10^{4}}{86,400\ (1-0.2)(1-0.1)(1-0.1)} \times 0.1 = 0.010\ cu.m/sec/100ha$$

where; 4.4mm; Average evapotranspiration during wet season
1.5mm, Average percolation rate per day

FIGURE D 11-2 DIAGRAM OF RUN-OFF CAPACITY IN PADDY FIELD

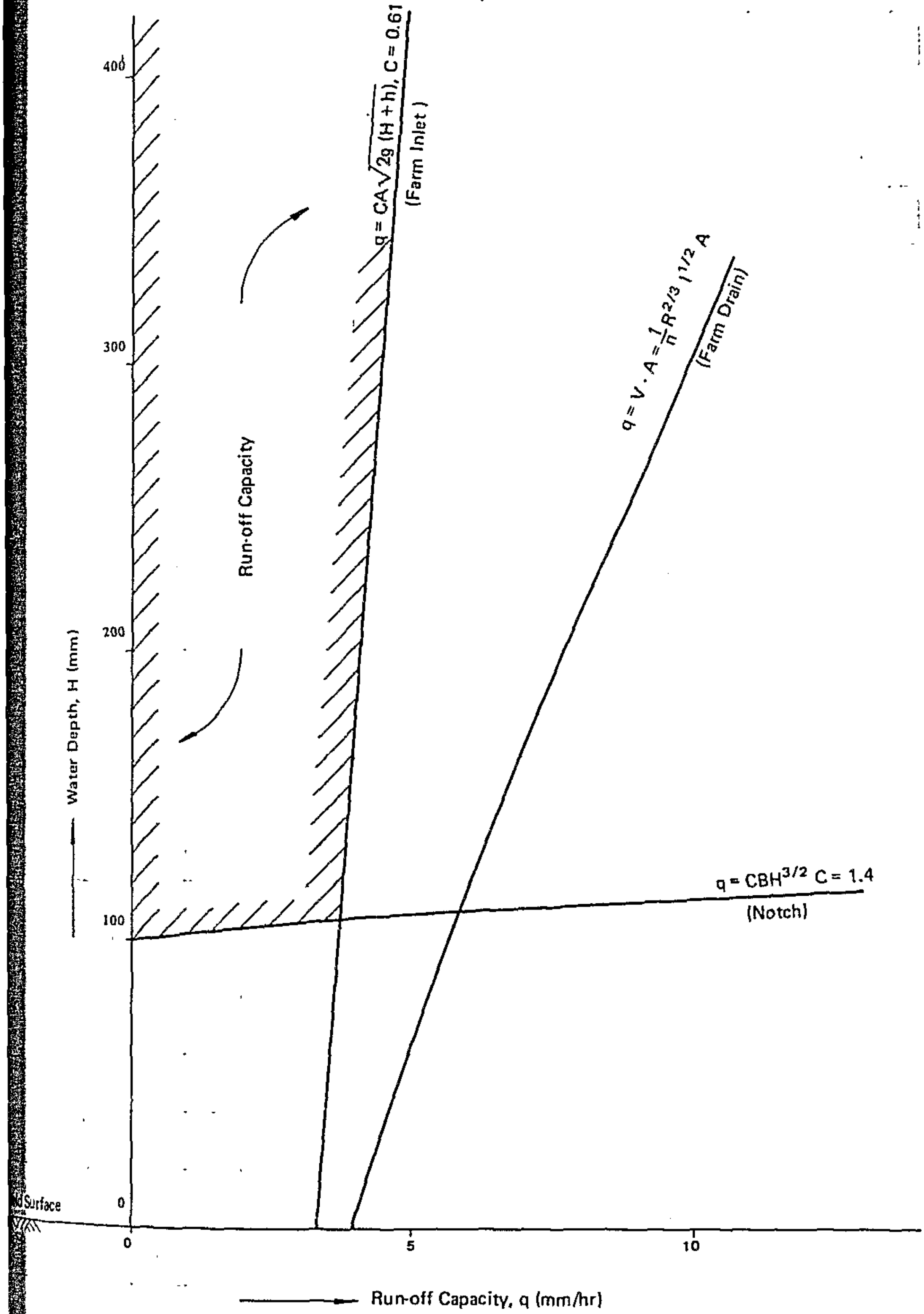
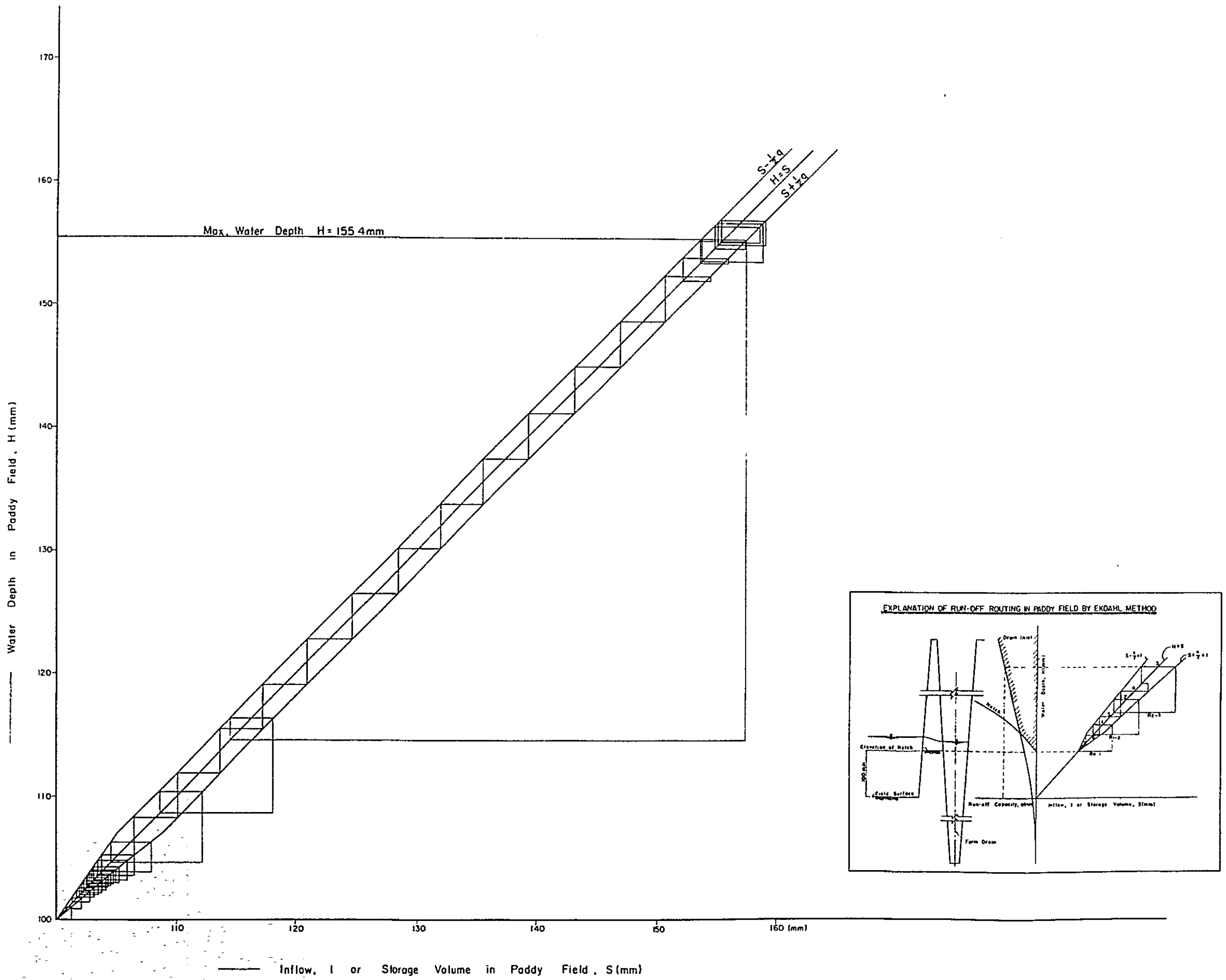


FIGURE D 11-3 DIAGRAM OF RUN-OFF ROUTING IN PADDY FIELD



APPENDIX E. RESERVOIR PLAN, HYDRO-POWER GENERATION AND FLOOD CONTROL

APPENDIX E. RESERVOIR PLAN, HYDROPOWER GENERATION AND FLOOD CONTROL

Table E 1-1 Preliminary Water Balance Study for Reservoir During First Stage Survey

(Simulation Period: 28 years 1952 - 79)

	Study Case	Reservoir: Reservoir Cap. (MCM)	Reservoir: Installed Power Cap. (KW)	Demand: Annual Demand (MCM)	Demand: Crop Intensity in Dry S. (%)	Shortage: Years (yrs)	Shortage: Annual Shortage (MCM)	Spillage: Years (yrs)	Spillage: Annual Spillage (MCM)	Years in FSL (yrs)	Power Generation: Average Head (m)	Power Generation: Average Power (KW)	Power Generation: Annual Production (KWH)	Acceptable ?
I	1-1-1	396	5,900	319	100	-	-	-	-	-	-	-	-	x
	1-1-2	"	"	281	80	-	-	-	-	-	-	-	-	x
	1-1-3	"	"	272	75	-	-	-	-	-	-	-	-	x
	1-1-4	"	"	263	70	8	62	2	23	3	24.0	1,660	14,500,000	x
	1-1-5	"	"	253	60	5	67	2	48	4	27.0	1,800	15,700,000	x
	1-1-6	"	"	234	55	3	43	4	34	6	32.9	2,090	18,310,000	o
	1-1-7	"	"	225	50	2	10	4	47	7	36.0	2,220	19,400,000	o
	1-2-1	396	5,900	251	100	5	66	2	44	5	27.3	1,790	15,680,000	x
	1-2-2	"	"	239	90	3	62	3	35	5	31.3	2,010	17,570,000	o
	1-2-3	"	"	227	80	2	24	4	41	7	35.2	2,180	19,080,000	o
	1-2-4	"	"	221	75	-	-	-	-	-	-	-	-	o
	1-2-5	"	"	215	70	-	-	-	-	-	-	-	-	o
II	2-1-1	325	5,200	319	100	-	-	-	-	-	-	-	-	x
	2-1-2	"	"	281	80	-	-	-	-	-	-	-	-	x
	2-1-3	"	"	272	75	-	-	-	-	-	-	-	-	x
	2-1-4	"	"	263	70	10	59	2	38	4	20.6	1,440	12,580,000	x
	2-1-5	"	"	253	60	8	48	3	41	5	22.8	1,530	13,390,000	x
	2-1-6 */	"	"	234	55	3	58	4	34	6	28.2	1,790	15,700,000	o
	2-1-7	"	"	225	50	2	32	4	61	7	31.4	1,940	16,980,000	o
	2-2-1	325	5,200	251	100	6	64	3	41	5	23.0	1,530	13,340,000	x
	2-2-2 */	"	"	239	90	3	77	4	45	6	26.3	1,700	14,850,000	o
	2-2-3	"	"	227	80	2	46	4	58	7	30.6	1,900	16,620,000	o
	2-2-4	"	"	221	75	-	-	-	-	-	-	-	-	o
	2-2-5	"	"	215	70	-	-	-	-	-	-	-	-	o
III	3-1-1	263	4,600	319	100	-	-	-	-	-	-	-	-	x
	3-1-2	"	"	281	80	-	-	-	-	-	-	-	-	x
	3-1-3	"	"	272	75	-	-	-	-	-	-	-	-	x
	3-1-4	"	"	263	70	12	58	3	48	4	17.6	1,230	10,720,000	x
	3-1-5	"	"	253	60	10	49	3	62	5	19.3	1,300	11,410,000	x
	3-1-6	"	"	234	55	3	70	4	60	7	23.3	1,510	13,180,000	o
	3-1-7	"	"	225	50	3	34	6	47	8	26.8	1,670	14,620,000	o
	3-2-1	263	4,600	251	100	10	47	3	61	5	19.5	1,300	11,370,000	x
	3-2-2	"	"	239	90	5	54	4	51	7	21.7	1,410	12,380,000	x
	3-2-3	"	"	227	80	3	44	5	52	8	25.9	1,630	14,260,000	o
	3-2-4	"	"	221	75	-	-	-	-	-	-	-	-	o
	3-2-5	"	"	215	70	-	-	-	-	-	-	-	-	o
IV	4-1-1	207	3,900	319	100	-	-	-	-	-	-	-	-	x
	4-1-2	"	"	281	80	-	-	-	-	-	-	-	-	x
	4-1-3	"	"	272	75	-	-	-	-	-	-	-	-	x
	4-1-4	"	"	263	70	14	56	4	47	5	14.8	1,030	8,980,000	x
	4-1-5	"	"	253	60	13	45	4	54	6	16.2	1,100	9,590,000	x
	4-1-6	"	"	234	55	6	45	5	56	8	18.8	1,230	10,720,000	x
	4-1-7	"	"	225	50	3	49	6	54	9	21.6	1,360	11,940,000	o
	4-2-1	207	3,900	251	100	13	44	4	53	6	16.2	1,090	9,500,000	x
	4-2-2	"	"	239	90	9	40	5	48	7	17.8	1,170	10,220,000	x
	4-2-3	"	"	227	80	3	55	6	49	8	20.8	1,320	11,580,000	o
	4-2-4	"	"	221	75	-	-	-	-	-	-	-	-	o
	4-2-5	"	"	215	70	-	-	-	-	-	-	-	-	o

Note) o: acceptable, x: not acceptable
-: not simulated

*/ Recommendable Case for deciding the Reservoir and Demand Scale.
Reservoir Capacity = 325 MCM
Demand Scale = 234 - 239 MCM/annum

Table E 1-2 Result of Final Water Balance Study (Reservoir Elevation)

(Unit: MSL, m)

Water Year	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual
1952	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	390.00	390.00	390.00	388.89	386.34	389.04
1953	385.32	385.48	386.94	386.66	390.00	390.00	390.00	390.00	390.00	390.00	388.13	386.77	388.27
1954	384.96	385.55	386.00	383.10	385.23	387.95	388.84	388.64	389.17	388.90	386.89	384.18	386.62
1955	381.96	382.16	383.51	382.29	385.96	389.13	389.01	389.58	390.00	389.88	387.97	385.14	386.38
1956	383.28	383.81	384.07	384.70	388.94	390.00	389.59	390.00	390.00	389.91	387.97	385.12	387.28
1957	383.24	383.03	383.82	381.75	384.04	387.99	386.90	386.54	386.88	386.57	384.52	381.50	384.73
1958	380.01	379.90	380.06	378.02	380.66	383.17	383.07	382.38	382.63	382.37	380.12	376.37	380.73
1959	373.44	373.60	373.29	372.45	375.86	382.11	382.34	382.82	383.43	383.53	381.34	377.78	378.50
1960	374.48	374.65	374.43	373.00	375.97	379.34	378.63	378.31	379.52	378.94	376.25	372.43	376.33
1961	369.92	370.39	371.21	368.04	373.65	380.72	382.40	383.22	384.59	384.40	382.23	379.07	377.49
1962	375.89	376.04	375.80	375.58	378.80	380.18	380.87	380.41	380.71	380.24	377.63	373.82	378.00
1963	370.47	369.95	369.96	366.05	371.04	373.38	376.37	380.79	382.33	382.28	380.15	376.86	374.97
1964	374.76	375.49	375.83	376.62	378.93	382.97	384.86	385.38	386.15	385.93	383.84	380.55	380.94
1965	377.43	377.43	377.84	373.86	376.60	379.56	381.26	383.23	384.48	384.31	382.13	378.65	379.73
1966	375.45	375.72	375.08	372.72	376.31	380.18	379.80	379.30	379.58	379.00	376.36	371.99	376.79
1967	369.08	369.45	369.11	366.27	369.16	377.29	375.82	376.18	376.99	376.60	373.75	369.24	372.41
1968	367.79	368.57	368.71	361.95	363.03	363.44	362.37	361.96	362.90	361.80	356.43	350.00	362.41
1969	350.00	352.19	351.96	350.00	357.19	357.62	353.64	355.13	356.29	355.19	350.00	350.00	353.22
1970	350.00	352.07	358.27	355.14	370.99	376.18	375.29	375.38	377.17	376.93	374.21	370.16	367.65
1971	366.41	366.99	363.84	373.68	380.98	384.80	385.77	386.52	387.56	387.49	385.46	382.22	379.72
1972	381.10	380.77	380.98	377.40	380.97	383.39	383.07	384.42	385.57	385.48	383.27	380.68	382.28
1973	377.68	377.76	378.07	378.01	389.75	390.00	390.00	390.00	390.00	390.00	388.29	386.09	385.47
1974	384.57	384.57	384.36	381.87	383.03	385.70	384.84	385.63	385.85	386.29	383.95	380.46	384.26
1975	377.45	377.08	378.81	382.61	390.00	390.00	390.00	390.00	390.00	390.00	388.68	386.51	385.93
1976	384.39	384.32	384.12	381.25	381.77	384.17	384.56	384.92	385.39	385.48	383.11	380.24	383.64
1977	378.59	378.84	378.15	376.32	377.64	381.15	380.11	380.08	381.05	381.48	380.39	377.09	379.24
1978	374.11	374.50	374.20	377.64	381.92	386.35	386.60	386.44	386.76	386.79	385.35	382.27	381.91
1979	380.40	381.11	381.79	379.25	379.80	379.67	378.65	377.70	377.73	377.07	375.14	370.90	378.27
Average	375.26	375.61	376.12	374.87	378.82	381.70	381.65	382.32	382.95	382.74	380.44	377.23	379.13
Maximum	385.32	385.55	386.94	386.66	390.00	390.00	390.00	390.00	390.00	390.00	388.89	386.77	390.00
Minimum	350.00	352.07	351.96	350.00	357.19	357.02	353.64	355.13	356.29	355.19	350.00	350.00	350.00

Note: This table shows the result of study on the Reservoir Case 2 and the Demand Case 4.

Table E 1-3 Result of Final Water Balance Study (Reservoir Volume)

(Unit: MCM)

Water Year	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual
1952	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	325.00	325.00	325.00	325.00	311.30	279.64	315.15
1953	267.01	268.96	287.06	283.64	325.00	325.00	325.00	325.00	325.00	325.00	301.91	285.00	303.63
1954	262.62	269.86	275.48	241.83	265.85	299.70	310.73	308.18	314.82	311.41	286.51	253.89	283.41
1955	228.95	231.20	246.34	232.66	275.17	314.25	312.83	319.79	325.00	323.62	299.86	264.79	281.20
1956	243.76	249.75	252.59	259.67	311.89	325.00	319.94	325.00	325.00	323.98	299.94	264.55	291.75
1957	243.29	240.96	249.88	226.66	252.34	300.10	286.61	282.17	286.38	282.48	257.67	223.81	261.03
1958	207.11	206.08	207.73	188.06	214.50	242.54	241.44	233.66	236.54	233.60	208.36	172.15	215.98
1959	145.91	147.24	144.68	137.65	167.32	230.66	233.20	238.66	245.47	246.54	222.10	185.69	195.43
1960	154.69	156.09	154.27	142.27	168.39	200.66	193.91	190.77	202.45	196.87	171.07	137.46	172.41
1961	116.50	120.31	127.17	103.69	147.68	215.10	233.92	243.15	258.50	256.29	232.02	198.16	187.71
1962	167.61	169.07	166.74	164.57	195.51	209.04	216.83	211.60	214.95	209.76	184.32	149.11	188.26
1963	120.97	116.67	116.79	90.16	125.80	145.40	172.20	215.86	233.17	232.58	208.69	176.89	162.93
1964	157.00	163.73	166.96	174.63	196.79	240.31	261.47	267.81	277.36	274.55	250.11	213.22	220.33
1965	182.41	182.34	186.28	149.44	174.39	202.86	221.17	243.23	257.23	255.38	230.88	194.06	206.64
1966	163.34	165.94	159.85	139.91	171.66	209.04	205.08	200.33	203.03	197.46	172.14	133.78	176.80
1967	110.79	113.30	110.95	91.66	111.34	181.05	166.90	170.38	178.16	174.44	148.54	111.88	139.12
1968	102.00	107.29	108.29	65.95	72.02	74.30	68.30	65.99	71.26	65.10	36.46	14.00	70.91
1969	14.00	20.58	19.90	14.00	40.40	39.54	24.93	29.69	35.74	29.99	14.00	14.00	24.73
1970	14.00	20.21	46.03	29.76	125.35	170.37	161.85	162.68	179.85	177.61	152.37	118.36	113.20
1971	92.59	96.58	109.12	147.77	218.02	260.84	272.57	281.87	294.74	293.93	268.75	231.97	214.06
1972	219.41	215.69	218.06	182.06	217.89	245.07	241.45	256.59	270.07	268.97	243.70	214.66	232.80
1973	184.81	185.51	188.49	187.96	321.95	325.00	325.00	325.00	325.00	325.00	303.89	276.60	272.85
1974	258.23	258.29	255.85	227.97	241.04	271.77	261.31	270.84	273.58	279.06	251.25	212.17	255.11
1975	182.56	178.99	195.61	236.29	325.00	325.00	325.00	325.00	325.00	325.00	308.67	281.83	277.83
1976	256.18	255.40	253.21	221.02	226.86	253.80	258.13	262.17	267.77	268.98	241.87	209.78	247.95
1977	193.40	195.90	189.24	171.71	184.35	219.96	208.23	207.99	218.77	223.63	211.39	179.08	200.30
1978	151.60	154.84	152.29	184.37	228.51	279.84	282.86	280.94	284.94	285.24	267.37	232.50	232.11
1979	211.51	219.44	227.15	199.84	205.11	203.83	194.07	185.00	185.24	178.87	160.41	124.60	191.25
Average	172.30	174.45	178.37	166.49	204.08	233.70	237.50	241.23	247.86	246.08	223.05	191.20	209.69
Maximum	267.01	269.86	287.06	283.64	325.00	325.00	325.00	325.00	325.00	325.00	311.30	285.00	325.00
Minimum	14.00	20.21	19.90	14.00	40.40	39.54	24.93	29.69	35.74	29.99	14.00	14.00	14.00

Note: This table shows the result of study on the Reservoir Case 2 and the Demand Case 4.

Table E 1-4 Result of Final Water Balance Study (Evaporation Loss)

(Unit: MCM)

Water Year	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual
1952	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	1.09	0.92	0.96	1.18	1.62	5.80
1953	1.75	1.63	1.33	1.27	1.22	1.32	1.33	1.09	0.92	0.96	1.17	1.62	15.67
1954	1.75	1.63	1.32	1.19	1.09	1.21	1.28	1.06	0.89	0.94	1.14	1.54	15.09
1955	1.63	1.49	1.22	1.14	1.09	1.24	1.30	1.07	0.91	0.96	1.17	1.58	14.86
1956	1.68	1.56	1.25	1.19	1.07	1.30	1.33	1.09	0.92	0.96	1.17	1.58	15.24
1957	1.67	1.54	1.24	1.14	1.05	1.19	1.25	1.01	0.84	0.88	1.07	1.45	14.37
1958	1.52	1.41	1.12	1.03	0.95	1.07	1.11	0.90	0.75	0.79	0.95	1.26	12.92
1959	1.30	1.18	0.94	0.86	0.83	0.99	1.09	0.90	0.77	0.81	0.98	1.31	12.00
1960	1.34	1.22	0.97	0.88	0.83	0.95	0.99	0.80	0.68	0.72	0.86	1.13	11.44
1961	1.16	1.06	0.86	0.78	0.75	0.94	1.07	0.90	0.78	0.83	1.01	1.34	11.55
1962	1.40	1.27	1.01	0.94	0.90	1.00	1.04	0.85	0.71	0.74	0.89	1.17	11.97
1963	1.20	1.06	0.84	0.74	0.69	0.81	0.89	0.81	0.73	0.78	0.95	1.27	10.83
1964	1.33	1.23	1.00	0.95	0.91	1.04	1.14	0.96	0.82	0.87	1.05	1.40	12.77
1965	1.45	1.32	1.05	0.94	0.85	0.96	1.03	0.89	0.78	0.83	1.00	1.34	12.51
1966	1.38	1.25	0.99	0.89	0.83	0.97	1.02	0.83	0.69	0.72	0.86	1.12	11.61
1967	1.14	1.03	0.82	0.73	0.67	0.84	0.93	0.75	0.64	0.67	0.81	1.04	10.13
1968	1.07	0.99	0.80	0.67	0.55	0.59	0.59	0.46	0.39	0.41	0.44	0.43	7.44
1969	0.37	0.39	0.34	0.28	0.33	0.43	0.39	0.30	0.27	0.29	0.29	0.32	4.04
1970	0.37	0.38	0.42	0.44	0.56	0.85	0.91	0.74	0.64	0.68	0.81	1.06	7.90
1971	1.06	0.94	0.78	0.82	0.91	1.10	1.18	0.99	0.85	0.90	1.10	1.47	12.15
1972	1.56	1.45	1.15	1.03	0.95	1.07	1.12	0.93	0.81	0.85	1.04	1.39	13.41
1973	1.46	1.33	1.06	1.00	1.09	1.32	1.33	1.09	0.92	0.96	1.18	1.60	14.40
1974	1.73	1.60	1.27	1.15	1.04	1.14	1.18	0.97	0.82	0.87	1.06	1.40	14.27
1975	1.45	1.31	1.06	1.08	1.16	1.32	1.33	1.09	0.92	0.96	1.18	1.62	14.55
1976	1.73	1.59	1.26	1.13	1.01	1.10	1.15	0.95	0.81	0.85	1.03	1.38	14.06
1977	1.47	1.36	1.08	0.98	0.89	1.00	1.04	0.84	0.71	0.76	0.94	1.28	12.41
1978	1.33	1.21	0.96	0.94	0.97	1.13	1.22	1.00	0.84	0.88	1.08	1.47	13.09
1979	1.55	1.44	1.17	1.07	0.96	1.00	1.00	0.80	0.66	0.68	0.83	1.09	12.30
Average	1.36	1.25	1.01	0.93	0.90	1.03	1.08	0.90	0.77	0.80	0.97	1.29	12.37

Note: This table shows the result of study on the Reservoir Case 2 and the Demand Case 4.

Table E 1-5 Result of Final Water Balance Study (Spillage)

(Unit: MCM)

Water Year	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual
1952	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	0.00	0.00	0.00	0.00	0.00	0.00
1953	0.00	0.00	0.00	0.00	0.00	21.79	0.00	0.00	0.00	0.00	0.00	0.00	21.79
1954	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1955	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1956	0.00	0.00	0.00	0.00	0.00	9.97	0.00	0.00	0.00	0.00	0.00	0.00	9.97
1957	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1958	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1959	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1960	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1961	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1962	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1963	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1964	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1965	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1966	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1967	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1968	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1969	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1970	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1971	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1972	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1973	0.00	0.00	0.00	0.00	0.00	86.26	4.44	0.00	0.00	0.00	0.00	0.00	90.71
1974	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.00	0.00	0.00	60.66	15.14	0.00	0.00	0.00	0.00	0.00	75.81
1976	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1978	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1979	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average	0.00	0.00	0.00	0.00	0.00	6.61	0.72	0.00	0.00	0.00	0.00	0.00	7.34

Note: This table shows the result of study on the Reservoir Case 2 and the Demand Case 4.

Table E 1-6 Result of Final Water Balance Study (Shortage)

(Unit: MCM)

Water Year	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual
1952	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	0.00	0.00	0.00	0.00	0.00	0.00
1953	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1954	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1955	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1956	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1957	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1958	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1959	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1960	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1961	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1962	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1963	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1964	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1965	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1966	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1967	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1968	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.22	16.22
1969	30.05	0.00	0.00	15.97	0.00	0.00	0.00	0.00	0.00	0.00	11.34	31.31	88.68
1970	15.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.37
1971	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1972	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1973	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1974	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1976	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1978	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1979	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average	1.68	0.00	0.00	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.40	1.69	4.37

Demand shortage 6 months

Note: This table shows the result of study on the Reservoir Case 2 and the Demand Case 4.

Table E 2-1 Dimensions of Hydropower Plants

Alternative Plan		Hydropower Plants: Left Saddle	Main Dam	Right Saddle	Total
Alternative-1					
Retention Water Level (RWL)	(MSL)	390m	-	390m	
Minimum Generating Water Level (MGL)	(")	356m	-	356m	
Minimum Water Level (MWL)	(")	350m	-	350m	
Generator Elevation	(")	350m	-	350m	
Tail Water Level (TWL)	(")	350m	-	350m	
Maximum Head (H max)		40m	-	40m	
Rated Head (H=Hmax X 2/3)		27m	-	27m	
Maximum Discharge (Qmax)		15.41cms	-	1.30cms	16.71cms
Rated Discharge (Q)		12.5 cms	-	1.0 cms	13.5 cms
Minimum Discharge (Qmin)		0.21cms	-	0.13cms	0.34cms
Generator					
Installed Capacity (n=86%)		2,840kw	-	230kw	3,070kw
Firm Capacity		-kw	-	-kw	-kw
Annual Production					
Average Head (Have)		29.0m	-	39.0m	
Annual Average Power		1,466 kw	-	122 kw	1,588kw
Annual Production		12,837 MWh	-	1,068 MWh	13,905MWh
Alternative-2					
Retention Water Level (RWL)	(MSL)	390m	390m	390m	
Minimum Generating Water Level (MGL)	(")	356m	356m	356m	
Minimum Water Level (MWL)	(")	350m	350m	350m	
Generator Elevation	(")	350m	338m	350m	
Tail Water Level (TWL)	(")	350m	338m	350m	
Maximum Head (Hmax)		40m	52m	40m	
Rated Head (H=Hmax X 2/3)		27m	39m*	27m	
Maximum Discharge (Qmax)		9.14cms	6.29cms	1.30cms	16.73cms
Rated Discharge (Q)		8.0 cms	5.0 cms	1.0 cms	14.0 cms
Minimum Discharge (Qmin)		0.17cms	0.04cms	0.13cms	0.34cms
Generator					
Installed Capacity (n=86%)		1,820kw	1,640kw	230kw	3,690kw
Firm Capacity		-kw	-kw	-kw	-kw
Annual Production					
Average Head		29.0m	40.6m	29.0m	
Annual Average Power		896 kw	843 kw	122 kw	1,861kw
Annual Production		7,846 MWh	7,385 MWh	1,068 MWh	16,299MWh
Alternative-3					
Retention Water Level (RWL)	(MSL)	390m	390m	390m	
Minimum Generating Water Level (MGL)	(")	356m	356m	356m	
Minimum Water Level (MWL)	(")	350m	350m	350m	
Generator Elevation	(")	350m	338m	350m	
Tail Water Level (TWL)	(")	350m	338m	350m	
Maximum Head (Hmax)		40m	52m	40m	
Rated Head (H=Hmax X 2/3)		27m	39m*	27m	
Maximum Discharge (Qmax)		3.10cms	12.31cms	1.30cms	16.71cms
Rated Discharge (Q)		2.3 cms	10.5 cms	1.0 cms	13.8 cms
Minimum Discharge (Qmin)		0.06cms	0.15cms	0.13cms	0.34cms
Generator					
Installed Capacity (n=86%)		520kw	3,450kw	230kw	4,200kw
Firm Capacity		-kw	-kw	-kw	-kw
Annual Production					
Average Head		29.0m	40.6m	29.0m	
Annual Average Power		282 kw	1,706 kw	122 kw	
Annual Production		2,468 MWh	14,946 MWh	1,068 MWh	18,482MWh

Note)
* (Hmax - MWL) X 2/3 + (MWL - TWL) = (390 - 350) X 2/3 + (350 - 338) = 39m

Table E 2-2 Monthly Power Production at Right Saddle Dam Plant

Year	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total
	Monthly Power Production (MWh)												
1952	-	-	-	-	-	-	-	94	122	171	155	171	-
53	50	33	52	146	103	66	103	56	122	171	155	129	1,186
54	90	16	59	171	83	62	82	117	119	171	155	168	1,293
55	97	22	55	171	84	73	128	93	122	171	155	171	1,342
56	86	16	64	122	92	66	129	122	122	171	155	171	1,316
57	78	46	40	171	80	62	164	111	112	171	155	155	1,345
58	49	35	42	151	79	54	70	99	99	171	155	142	1,146
59	71	16	13	84	60	53	114	100	102	157	155	163	1,088
1960	91	17	40	81	61	48	87	60	21	171	155	94	926
61	47	10	30	126	55	50	83	101	25	171	155	156	1,009
62	97	19	42	96	68	57	80	93	94	171	155	123	1,095
63	67	37	28	105	49	55	49	36	98	171	155	138	988
64	52	12	42	94	88	54	74	66	110	171	155	171	1,089
65	103	26	45	171	68	55	73	39	105	171	155	167	1,178
66	95	12	82	96	62	50	77	62	90	171	155	129	1,081
67	49	9	31	68	54	45	127	49	82	162	155	112	943
68	21	13	31	121	46	41	46	31	39	72	46	0	461
69	0	0	0	0	17	22	0	0	19	0	0	0	58
1970	0	0	12	0	49	49	94	77	25	164	155	109	734
71	54	8	27	89	72	106	118	86	115	171	155	171	1,172
72	51	29	51	171	87	63	132	40	109	171	155	136	1,195
73	104	19	46	118	93	66	169	84	122	171	155	171	1,318
74	73	25	56	171	100	58	98	50	109	68	155	171	1,134
75	90	19	40	122	94	84	75	56	47	171	155	171	1,124
76	113	24	56	171	74	72	89	90	108	141	155	141	1,234
77	53	13	53	117	65	51	99	91	22	140	155	158	1,017
78	85	11	40	84	74	60	129	111	112	171	155	171	1,203
79	71	15	52	171	84	84	107	84	84	164	155	103	1,174
Average Production (MWh)	68	18	41	118	71	59	96	74	87	154	145	137	1,068
" Power (kw)	94	25	58	158	96	82	129	104	117	207	216	185	122
" Head (m)	25.3	25.5	26	24.5	28.8	31.7	31.5	32.1	33	32.6	30.4	27.2	29.0

Note) This table shows the power production based on the data which are the diversion demand in the Right Bank Area (see Table D 7-8), the reservoir elevation (see Table E 1-2) and the hydropower elements of the Right Saddle Plant (see E 2-1). This power production is immutable through the all alternatives

Table E 2-5 Monthly Power Production at Left Saddle Dam Plant (Alternative-1)

Year	Monthly Power Production (MWh) Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total
1952	-	-	-	-	-	-	-	1,199	206	496	1,812	2,113	-
53	1,315	557	398	2,113	1,283	1,105	2,113	871	206	833	1,908	2,113	14,815
54	1,981	341	674	2,113	1,006	1,048	1,837	1,312	202	810	1,908	2,113	15,345
55	1,975	444	588	2,113	1,019	1,328	2,113	1,176	206	831	1,908	2,113	15,814
56	1,800	396	702	1,536	1,213	1,105	2,113	1,358	206	832	1,908	2,113	15,282
57	1,657	618	348	2,113	1,012	1,050	2,113	1,241	190	762	1,908	2,113	15,125
58	1,223	504	457	2,066	1,041	955	1,595	1,099	168	554	1,908	2,113	13,683
59	1,443	315	529	1,130	751	887	2,113	1,114	172	424	1,908	2,113	12,899
1960	1,777	329	457	1,007	754	811	1,978	802	34	603	1,708	1,633	11,893
61	1,017	210	303	1,588	664	849	1,783	1,128	48	716	1,908	2,113	12,327
62	1,879	359	453	1,257	836	1,010	1,792	1,032	158	630	1,798	1,963	13,167
63	1,356	453	271	1,367	660	1,056	1,068	555	167	673	1,908	2,113	11,647
64	1,200	263	496	1,165	1,273	911	1,657	944	186	748	1,908	2,113	12,864
65	1,991	437	521	2,113	865	927	1,574	661	178	715	1,908	2,113	14,003
66	1,847	289	634	1,372	751	834	1,653	850	153	604	1,716	1,956	12,659
67	1,058	223	336	1,048	763	754	2,113	723	139	554	1,546	1,712	10,969
68	604	252	346	1,340	723	824	1,034	381	66	246	419	0	6,235
69	0	0	0	0	225	434	0	0	33	0	0	0	692
1970	0	0	126	0	594	834	2,048	862	45	561	1,576	1,699	8,345
71	1,064	175	287	1,269	878	2,045	2,113	1,086	193	781	1,908	2,113	13,912
72	1,238	490	544	2,113	1,204	1,063	2,113	629	183	740	1,908	2,113	14,338
73	2,009	390	519	1,711	1,126	1,105	2,113	1,143	206	833	1,908	2,113	15,176
74	1,708	478	660	2,113	1,523	1,053	2,113	784	185	204	1,908	2,113	14,842
75	1,832	380	337	1,710	1,133	1,489	1,723	946	75	833	1,908	2,113	14,479
76	2,045	490	607	2,113	952	1,288	1,958	1,079	182	307	1,908	2,113	15,042
77	1,258	351	587	1,744	828	860	2,113	1,021	36	317	1,437	2,113	12,665
78	1,632	247	453	1,036	957	1,004	2,113	1,237	189	766	1,908	2,113	13,655
79	1,580	328	521	2,113	1,151	1,611	2,113	940	143	564	1,636	1,644	14,344
Average Production (MWh)	1,425	345	450	1,531	932	1,045	1,821	934	148	604	1,714	1,888	12,837
" Power (kw)	1,979	463	625	2,059	1,253	1,452	2,447	1,298	199	813	2,551	2,537	1,466
" Head (m)	25.3	25.5	26	24.5	28.8	31.7	31.5	32.1	33	32.6	30.4	27.2	29.0

Note) This table shows the power production for the Alternative-1 based on the data which are the total diversion demand in the Existing Irrigated Area and the High and Downstream Area, the reservoir elevation (see Table E 1-2) and the hydropower elements of the Left Saddle Plant (se E 2-1). However, the diversion demand is shown only as the representative one in the design and normal years in Table D 2-1.

Table E 2-4 Monthly Power Production at Main Dam Plant (Alternative-2)

Year	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total
	Monthly Power Production (MWh)												
1952	-	-	-	-	-	-	-	633	48	182	905	1,220	-
53	775	300	206	1,184	682	596	1,169	463	48	341	1,102	1,220	7,086
54	1,166	189	359	1,220	542	573	1,000	688	48	333	1,102	1,220	8,440
55	1,181	248	320	1,220	551	719	1,220	628	48	340	1,102	1,220	8,797
56	1,081	214	377	842	644	596	1,220	706	48	340	1,102	1,220	8,390
57	985	337	182	1,220	560	573	1,220	659	46	318	1,102	1,220	8,422
58	747	284	256	1,208	589	539	908	603	42	228	1,065	1,220	7,689
59	963	192	314	710	443	506	1,220	608	42	160	1,096	1,220	7,474
1960	1,170	197	273	623	444	474	1,179	462	10	269	967	1,088	7,156
61	717	136	186	1,076	400	490	1,019	614	11	304	1,102	1,220	7,275
62	1,181	214	266	757	478	582	1,044	576	40	277	1,002	1,220	7,637
63	950	292	172	978	417	662	647	310	42	290	1,066	1,220	7,046
64	783	158	292	687	738	516	932	521	45	314	1,102	1,220	7,308
65	1,181	258	299	1,220	506	535	911	371	44	304	1,102	1,220	7,951
66	1,181	176	364	862	440	484	969	493	39	269	970	1,220	7,467
67	757	147	218	748	510	451	1,220	429	36	253	904	1,207	6,880
68	446	172	223	1,088	574	649	850	308	23	156	466	0	4,955
69	0	0	0	0	243	490	0	0	17	0	0	0	750
1970	0	0	123	0	379	500	1,220	508	9	255	915	1,175	5,084
71	811	122	188	785	493	1,172	1,220	580	46	324	1,102	1,220	8,063
72	747	270	302	1,220	684	595	1,220	348	45	311	1,102	1,220	8,064
73	1,181	223	300	1,002	594	596	1,220	608	48	341	1,102	1,220	8,435
74	1,014	262	358	1,220	854	581	1,220	435	45	79	1,102	1,220	8,390
75	1,164	219	181	961	597	804	937	499	12	341	1,102	1,220	8,037
76	1,181	260	324	1,220	533	724	1,101	582	45	100	1,102	1,220	8,392
77	779	201	329	1,041	483	495	1,220	572	10	112	764	1,220	7,226
78	1,074	145	271	603	535	554	1,220	658	51	320	1,064	1,220	7,715
79	963	182	287	1,220	655	937	1,220	539	37	256	939	1,124	8,359
Average Production (MWh)	895	199	258	922	539	607	1,056	514	56	254	983	1,122	7,385
" Power (kw)	1,243	268	358	1,240	725	843	1,420	714	49	341	1,464	1,509	843
" Head (m)	36.4	36.6	37.6	35.6	40.8	43.7	43.1	43.7	45	44.1	42	38.4	40.6

Note) This table shows the power production for the Alternative-2 based on the data which are the diversion demand in the Existing Irrigated Area (see Table D 7-10), the reservoir elevation (see Table E 1-2) and the hydropower elements of the Main Dam Plan (see E 2-1).

Monthly Power Production (MWh)

Year	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total
1952	-	-	-	-	-	-	-	711	169	365	1,138	1,354	
53	736	324	242	1,279	759	646	1,255	505	169	571	1,223	1,326	-
54	1,105	199	405	1,354	594	613	1,064	778	165	556	1,223	1,354	9,035
55	1,100	263	345	1,354	606	778	1,354	695	169	569	1,223	1,354	9,410
56	1,005	230	423	910	720	646	1,354	806	169	570	1,223	1,354	9,810
57	926	363	214	1,354	597	613	1,354	736	155	522	1,223	1,354	9,410
58	682	301	274	1,220	610	559	921	652	138	386	1,220	1,253	9,411
59	801	182	316	667	442	518	1,354	661	141	306	1,223	1,354	8,216
1960	991	190	274	592	450	474	1,147	471	277	413	1,063	929	7,965
61	564	124	184	937	393	496	1,032	669	324	491	1,223	1,354	7,271
62	1,048	214	272	743	499	586	1,041	612	129	432	1,119	1,115	7,791
63	757	266	163	808	389	618	618	325	136	461	1,221	1,245	7,810
64	672	155	297	692	751	533	963	555	153	513	1,223	1,354	6,389
65	1,111	257	306	1,354	510	540	915	389	145	490	1,223	1,354	7,861
66	1,031	169	382	809	443	487	956	500	125	414	1,068	1,117	8,594
67	590	127	197	613	449	441	1,354	429	114	380	962	978	7,501
68	338	148	206	798	424	478	600	227	54	168	261	0	6,634
69	0	0	0	0	133	253	0	0	27	0	0	0	3,702
1970	0	0	76	0	354	490	1,184	511	58	385	980	967	413
71	595	103	172	748	522	1,222	1,354	642	158	536	1,223	1,354	4,985
72	692	288	326	1,354	711	618	1,354	371	150	507	1,223	1,293	8,629
73	1,121	228	309	1,004	670	646	1,354	674	169	571	1,223	1,354	8,887
74	955	275	394	1,354	897	610	1,297	459	151	144	1,223	1,354	9,323
75	1,022	222	202	1,007	674	871	1,002	552	57	571	1,223	1,354	9,113
76	1,264	289	359	1,354	565	752	1,132	638	149	233	1,223	1,317	8,757
77	703	202	349	1,023	485	503	1,297	606	29	236	904	1,354	9,275
78	909	144	266	615	568	588	1,354	734	155	525	1,223	1,354	7,691
79	883	190	312	1,354	677	937	1,354	558	117	387	1,018	934	8,435
													8,721
Average Production (MWh)	800	201	269	936	551	611	1,109	552	140	417	1,090	1,170	7,846
" Power (kw)	1,111	271	373	1,259	741	849	1,491	767	188	561	1,622	1,573	896
" Head (m)	25.3	25.5	26	24.5	28.8	31.7	31.5	32.1	33	32.6	30.4	27.2	29.0

Note) This table shows the power production for the Alternative-2 based on the data which are the diversion demand in the High and Downstream Area (see Table D 7-12), the reservoir elevation (see Table E 1-2) and the hydropower elements of the Left Saddle Plant (see E 2-1).

Table E 2-6 Monthly Power Production at Main Dam Plant (Alternative-3)

Year	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total
	Monthly Power Production (MWh)												
1952	-	-	-	-	-	-	-	1,242	195	487	1,859	2,567	-
53	1,429	589	413	2,312	1,339	1,156	2,252	913	195	828	2,318	2,512	16,256
54	2,166	368	719	2,567	1,073	1,111	1,928	1,375	192	810	2,318	2,567	17,194
55	2,213	496	629	2,567	1,089	1,389	2,567	1,232	195	826	2,318	2,567	18,088
56	1,993	429	755	1,651	1,264	1,156	2,567	1,412	195	827	2,318	2,567	17,134
57	1,832	675	375	2,567	1,100	1,112	2,567	1,318	183	773	2,318	2,567	17,387
58	1,387	569	502	2,361	1,158	1,036	1,741	1,205	167	571	2,160	2,567	15,424
59	1,767	383	644	1,388	877	981	2,567	1,218	170	437	2,222	2,567	15,221
1960	2,152	394	546	1,221	880	919	2,254	915	39	652	1,961	2,023	13,956
61	1,323	266	373	2,110	801	950	1,954	1,228	44	739	2,268	2,567	14,623
62	2,236	428	531	1,478	946	1,126	1,997	1,152	160	673	2,032	2,382	15,141
63	1,748	583	344	1,911	827	1,284	1,240	621	166	705	2,161	2,565	14,155
64	1,446	307	576	1,347	1,447	1,000	1,788	1,009	180	763	2,318	2,567	14,748
65	2,326	507	588	2,567	1,003	1,041	1,742	720	174	737	2,263	2,567	16,235
66	2,210	344	738	1,683	870	938	1,859	957	155	652	1,967	2,443	14,816
67	1,404	287	430	1,456	992	874	2,567	840	146	615	1,833	2,245	13,689
68	823	336	453	2,147	1,113	1,251	1,632	606	93	379	945	0	9,778
69	0	0	0	0	481	944	0	0	68	0	0	0	1,493
1970	0	0	242	0	749	974	2,427	1,015	46	620	1,857	2,191	10,121
71	1,496	237	375	1,527	976	2,268	2,567	1,147	186	788	2,318	2,567	16,452
72	1,392	541	604	2,567	1,338	1,158	2,567	674	178	756	2,318	2,567	16,660
73	2,341	447	591	1,957	1,176	1,156	2,567	1,181	195	828	2,318	2,567	17,324
74	1,864	513	706	2,567	1,666	1,128	2,423	837	179	204	2,318	2,567	16,972
75	2,133	439	373	1,870	1,181	1,546	1,802	974	73	828	2,318	2,567	16,104
76	2,484	531	659	2,567	1,045	1,395	2,114	1,153	178	311	2,313	2,567	17,317
77	1,454	392	667	2,027	946	960	2,514	1,143	40	326	1,578	2,567	14,614
78	1,986	299	542	1,188	1,049	1,076	2,567	1,315	182	777	2,173	2,567	15,721
79	1,787	363	574	2,567	1,292	1,814	2,567	1,078	149	622	1,904	2,095	16,812
Average Production (MWh)	1,681	597	516	1,858	1,062	1,175	2,123	1,017	147	626	2,035	2,309	14,946
" Power (kw)	2,334	533	717	2,497	1,427	1,632	2,854	1,412	197	841	3,029	3,103	1,706
" Head (m)	36.4	36.6	37.6	35.6	40.8	43.7	43.1	43.7	45	44.1	42	38.4	40.6

Note) This table shows the power production for the Alternative-3 based on the data which are the diversion demand in the Existing Irrigated Area, the reservoir elevation (see Table E 1-2) and the hydropower elements of the Main Dam Plan (see E 2-1). However, the diversion demand is shown only as the representative one in the design and normal years in Table D 2-3)

Year	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total
	Monthly Power Production (MWh)												
1952	-	-	-	-	-	-	-	234	57	122	349	387	-
53	240	108	78	387	253	215	387	168	57	187	349	387	2,816
54	369	66	135	387	198	204	355	262	55	182	349	387	2,949
55	366	83	117	387	202	256	387	232	57	187	349	387	3,010
56	335	71	143	309	237	215	387	271	57	187	349	387	2,948
57	304	116	71	387	199	204	387	248	52	171	349	387	2,875
58	225	98	91	387	208	186	310	220	46	129	349	387	2,636
59	269	61	104	226	151	173	387	222	47	102	349	387	2,478
1960	327	63	91	199	152	158	387	159	7	135	349	310	2,337
61	186	38	60	317	133	166	349	225	8	161	349	387	2,379
62	346	67	91	251	169	198	347	207	43	141	349	373	2,582
63	249	89	51	275	128	208	210	108	45	151	349	387	2,250
64	220	48	96	231	251	178	327	182	51	168	349	387	2,488
65	366	83	104	387	168	180	307	132	48	161	349	387	2,672
66	340	54	129	272	148	163	321	171	42	136	349	371	2,496
67	197	41	67	205	153	147	387	141	38	124	323	324	2,147
68	112	48	66	269	144	161	202	76	18	55	87	0	·1,238
69	0	0	0	0	44	86	0	0	9	0	0	0	139
1970	0	0	25	0	118	166	387	172	13	126	329	326	1,662
71	196	32	58	249	174	374	387	214	53	176	349	387	2,649
72	225	94	109	387	240	211	387	121	50	166	349	387	2,726
73	369	71	105	341	223	215	387	225	57	187	349	387	2,916
74	315	89	129	387	301	209	387	150	51	42	349	387	2,796
75	341	70	68	336	225	290	337	187	19	187	349	387	2,796
76	374	89	120	387	186	256	380	212	50	74	349	387	2,864
77	234	68	119	345	161	168	387	204	7	74	306	387	2,460
78	305	46	91	207	187	196	387	248	51	173	349	387	2,627
79	292	58	104	387	223	312	387	188	39	126	341	313	2,770
Average Production (MWh)	263	64	89	292	184	203	342	184	40	136	323	348	2,468
" Power (kw)	365	87	124	393	247	282	460	257	53	183	482	468	282
" Head (m)	25.3	25.5	26	24.5	28.8	31.7	31.5	32.1	33	32.6	30.4	27.2	29.0

Note) This table shows the power production for the Alternative-3 based on the data which are the diversion demand in the High and Downstream Area, the reservoir elevation (see Table E 1-2) and the hydropower elements of the Left Saddle Plant (see E 2-1). However, the diversion demand is shown only as the representative one in the design and normal years in Table D 2-3.

Table E 3-1 (1) Flood Control Simulation for Before Project on 1 to 2 Years

** PROJECT STATUS —— BEFORE PROJECT
** RETURN PERIOD ——— 1 TO 2 YRS
** RUN DATE/TIME —— SEP. 8,1981/AM 9.30

TIME DAY	HRS	INFLOW AT DAM SITE (CUM/S)	SPILLAGE FROM DAM (CUM/S)	INFLOW TO INT.POINT (CUM/S)	OUTFLOW INT.POINT (CUM/S)	BALANCE INT.POINT (CUM/S)	BALANCE INT.POINT (MCM)	INUNDATED VOLUME (MCM)	INUNDATED DEPTH (M)	INUNDATED STAGE (EL.M)	INUNDATED AREA (HA)
1	0- 3	20.	-	59.	59.	0.	0.000	0.001	0.01	289.21	14.
1	3- 6	20.	-	59.	58.	0.	0.005	0.006	0.03	289.23	43.
1	6- 9	22.	-	64.	64.	-0.	-0.000	0.006	0.03	289.23	43.
1	9- 12	25.	-	73.	73.	-0.	-0.000	0.006	0.03	289.23	43.
1	12- 15	29.	-	85.	85.	-0.	-0.000	0.006	0.03	289.23	43.
1	15- 18	41.	-	120.	120.	-0.	-0.000	0.006	0.03	289.23	43.
1	18- 21	84.	-	246.	246.	-0.	-0.000	0.006	0.03	289.23	43.
1	21- 24	155.	-	454.	320.	134.	1.443	1.450	0.39	289.59	752.
2	24- 27	188.	-	550.	320.	230.	2.486	3.936	0.63	289.83	1245.
2	27- 30	129.	-	377.	320.	57.	0.621	4.558	0.68	289.88	1341.
2	30- 33	114.	-	334.	320.	14.	0.147	4.706	0.69	289.89	1363.
2	33- 36	112.	-	328.	320.	8.	0.084	4.790	0.70	289.90	1375.
2	36- 39	116.	-	339.	320.	19.	0.210	5.001	0.71	289.91	1405.
2	39- 42	118.	-	345.	320.	25.	0.274	5.275	0.73	289.93	1443.
2	42- 45	122.	-	357.	320.	37.	0.400	5.676	0.76	289.96	1497.
2	45- 48	123.	-	360.	320.	40.	0.432	6.108	0.79	289.99	1556.
3	48- 51	124.	-	363.	320.	43.	0.463	6.572	0.82	290.02	1612.
3	51- 54	124.	-	363.	320.	43.	0.463	7.035	0.84	290.04	1661.
3	54- 57	121.	-	354.	320.	34.	0.368	7.404	0.87	290.07	1712.
3	57- 60	116.	-	339.	320.	19.	0.210	7.615	0.88	290.08	1736.
3	60- 63	116.	-	339.	320.	19.	0.210	7.826	0.89	290.09	1763.
3	63- 66	116.	-	339.	320.	19.	0.210	8.037	0.90	290.10	1786.
3	66- 69	117.	-	342.	320.	22.	0.242	8.280	0.91	290.11	1810.
3	69- 72	118.	-	345.	320.	25.	0.274	8.554	0.93	290.13	1843.
4	72- 75	117.	-	342.	320.	22.	0.242	8.796	0.94	290.14	1866.
4	75- 78	113.	-	331.	320.	11.	0.116	8.912	0.95	290.15	1879.
4	78- 81	101.	-	296.	320.	-24.	-0.264	8.649	0.94	290.13	1851.
4	81- 84	88.	-	258.	320.	-62.	-0.674	7.975	0.90	290.10	1777.
4	84- 87	84.	-	246.	320.	-74.	-0.801	7.175	0.85	290.05	1685.
4	87- 90	80.	-	234.	320.	-86.	-0.927	6.248	0.80	290.00	1571.
4	90- 93	78.	-	228.	320.	-92.	-0.990	5.258	0.73	289.93	1441.
4	93- 96	74.	-	217.	320.	-103.	-1.117	4.142	0.65	289.85	1278.
5	96- 99	71.	-	208.	320.	-112.	-1.212	2.931	0.55	289.75	1013.
5	99-102	69.	-	202.	320.	-118.	-1.275	1.656	0.41	289.61	855.
5	102-105	66.	-	193.	320.	-127.	-1.370	0.287	0.17	289.37	332.
5	105-108	64.	-	187.	213.	-26.	-0.281	0.006	0.03	289.23	43.
5	108-111	61.	-	178.	179.	-0.	-0.001	0.006	0.03	289.23	43.
5	111-114	59.	-	173.	173.	-0.	-0.000	0.006	0.03	289.23	43.
5	114-117	57.	-	167.	167.	-0.	-0.000	0.006	0.03	289.23	43.
5	117-120	56.	-	164.	164.	-0.	-0.000	0.006	0.03	289.23	43.
6	120-123	54.	-	158.	158.	-0.	-0.000	0.006	0.03	289.23	43.
6	123-126	52.	-	152.	152.	-0.	-0.000	0.006	0.03	289.23	43.
6	126-129	50.	-	146.	146.	-0.	-0.000	0.006	0.03	289.23	43.
6	129-132	49.	-	143.	143.	-0.	-0.000	0.006	0.03	289.23	43.
6	132-135	47.	-	138.	138.	-0.	-0.000	0.006	0.03	289.23	43.
6	135-138	46.	-	135.	135.	-0.	-0.000	0.006	0.03	289.23	43.
6	138-141	44.	-	129.	129.	-0.	-0.000	0.006	0.03	289.23	43.
6	141-144	43.	-	126.	126.	-0.	-0.000	0.006	0.03	289.23	43.
7	144-147	42.	-	123.	123.	-0.	-0.000	0.006	0.03	289.23	43.
7	147-150	40.	-	117.	117.	-0.	-0.000	0.006	0.03	289.23	43.
7	150-153	39.	-	114.	114.	-0.	-0.000	0.006	0.03	289.23	43.
7	153-156	38.	-	111.	111.	-0.	-0.000	0.006	0.03	289.23	43.
7	156-159	37.	-	108.	108.	-0.	-0.000	0.006	0.03	289.23	43.
7	159-162	36.	-	105.	105.	-0.	-0.000	0.006	0.03	289.23	43.
7	162-165	34.	-	99.	100.	-0.	-0.000	0.006	0.03	289.23	43.
7	165-168	33.	-	97.	97.	-0.	-0.000	0.006	0.03	289.23	43.
8	168-171	32.	-	94.	94.	-0.	-0.000	0.006	0.03	289.23	43.
8	171-174	32.	-	94.	94.	-0.	-0.000	0.006	0.03	289.23	43.
8	174-177	31.	-	91.	91.	-0.	-0.000	0.006	0.03	289.23	43.
8	177-180	29.	-	85.	85.	-0.	-0.000	0.006	0.03	289.23	43.
8	180-183	28.	-	82.	82.	-0.	-0.000	0.006	0.03	289.23	43.
8	183-186	28.	-	82.	82.	-0.	-0.000	0.006	0.03	289.23	43.
8	186-189	27.	-	79.	79.	-0.	-0.000	0.006	0.03	289.23	43.
8	189-192	26.	-	76.	76.	-0.	-0.000	0.006	0.03	289.23	43.
9	192-195	26.	-	76.	76.	-0.	-0.000	0.006	0.03	289.23	43.
9	195-198	25.	-	73.	73.	-0.	-0.000	0.006	0.03	289.23	43.
9	198-201	24.	-	70.	70.	-0.	-0.000	0.006	0.03	289.23	43.
9	201-204	23.	-	67.	67.	-0.	-0.000	0.006	0.03	289.23	43.
9	204-207	23.	-	67.	67.	-0.	-0.000	0.006	0.03	289.23	43.
9	207-210	22.	-	64.	64.	-0.	-0.000	0.006	0.03	289.23	43.
9	210-213	22.	-	64.	64.	-0.	-0.000	0.006	0.03	289.23	43.
9	213-216	22.	-	64.	64.	-0.	-0.000	0.006	0.03	289.23	43.
10	216-219	21.	-	61.	62.	-0.	-0.000	0.006	0.03	289.23	43.
10	219-222	21.	-	61.	62.	-0.	-0.000	0.006	0.03	289.23	43.
10	222-225	21.	-	61.	62.	-0.	-0.000	0.006	0.03	289.23	43.
10	225-228	21.	-	61.	62.	-0.	-0.000	0.006	0.03	289.23	43.
10	228-231	20.	-	59.	59.	-0.	-0.000	0.006	0.03	289.23	43.
10	231-234	20.	-	59.	59.	-0.	-0.000	0.006	0.03	289.23	43.
10	234-237	20.	-	59.	59.	-0.	-0.000	0.006	0.03	289.23	43.
10	237-240	20.	-	59.	59.	-0.	-0.000	0.006	0.03	289.23	43.

Table E 3-1(2) Flood Control Simulation for After Project on 1 to 2 Years

** PROJECT STATUS --- AFTER PROJECT
** RETURN PERIOD --- 1 TO 2 YRS

** RUN DATE/TIME --- SEP. 8,1981/AM 9.30

TIME		INFLOW AT DAM SITE	SPILLAGE FROM DAM	INFLOW TO INT.POINT	OUTFLOW INT.POINT	BALANCE INT.POINT	BALANCE INT.POINT	INUNDATED VOLUME	INUNDATED DEPTH	INUNDATED STAGE	INUNDATED AREA
DAY	HRS	(CUM/S)	(CUM/S)	(CUM/S)	(CUM/S)	(CUM/S)	(MCM)	(MCM)	(M)	(EL.M)	(HA)
1	0- 3	20.	0.	39.	39.	0.	0.000	0.001	0.01	289.21	14.
1	3- 6	20.	0.	39.	38.	0.	0.005	0.006	0.03	289.23	43.
1	6- 9	22.	0.	42.	42.	-0.	-0.000	0.006	0.03	289.23	43.
1	9- 12	25.	0.	48.	48.	-0.	-0.000	0.006	0.03	289.23	43.
1	12- 15	29.	0.	56.	56.	-0.	-0.000	0.006	0.03	289.23	43.
1	15- 18	41.	0.	79.	79.	-0.	-0.000	0.006	0.03	289.23	43.
1	18- 21	84.	0.	162.	162.	-0.	-0.000	0.006	0.03	289.23	43.
1	21- 24	155.	0.	299.	299.	-0.	-0.000	0.006	0.03	289.23	43.
2	24- 27	188.	0.	362.	320.	42.	0.455	0.462	0.22	289.42	421.
2	27- 30	129.	0.	248.	291.	-42.	-0.456	0.006	0.03	289.23	43.
2	30- 33	114.	0.	220.	220.	-0.	-0.001	0.006	0.03	289.23	43.
2	33- 36	112.	0.	216.	216.	-0.	-0.000	0.006	0.03	289.23	43.
2	36- 39	116.	0.	223.	224.	-0.	-0.000	0.006	0.03	289.23	43.
2	39- 42	118.	0.	227.	227.	-0.	-0.000	0.006	0.03	289.23	43.
2	42- 45	122.	0.	235.	235.	-0.	-0.000	0.006	0.03	289.23	43.
2	45- 48	123.	0.	237.	237.	-0.	-0.000	0.006	0.03	289.23	43.
3	48- 51	124.	0.	239.	239.	-0.	-0.000	0.006	0.03	289.23	43.
3	51- 54	124.	0.	239.	239.	-0.	-0.000	0.006	0.03	289.23	43.
3	54- 57	121.	0.	233.	233.	-0.	-0.000	0.006	0.03	289.23	43.
3	57- 60	116.	0.	223.	224.	-0.	-0.000	0.006	0.03	289.23	43.
3	60- 63	116.	0.	223.	224.	-0.	-0.000	0.006	0.03	289.23	43.
3	63- 66	116.	0.	223.	224.	-0.	-0.000	0.006	0.03	289.23	43.
3	66- 69	117.	0.	225.	225.	-0.	-0.000	0.006	0.03	289.23	43.
3	69- 72	118.	0.	227.	227.	-0.	-0.000	0.006	0.03	289.23	43.
4	72- 75	117.	0.	225.	225.	-0.	-0.000	0.006	0.03	289.23	43.
4	75- 78	113.	0.	218.	218.	-0.	-0.000	0.006	0.03	289.23	43.
4	78- 81	101.	0.	195.	195.	-0.	-0.000	0.006	0.03	289.23	43.
4	81- 84	88.	0.	170.	170.	-0.	-0.000	0.006	0.03	289.23	43.
4	84- 87	84.	0.	162.	162.	-0.	-0.000	0.006	0.03	289.23	43.
4	87- 90	80.	0.	154.	154.	-0.	-0.000	0.006	0.03	289.23	43.
4	90- 93	78.	0.	150.	150.	-0.	-0.000	0.006	0.03	289.23	43.
4	93- 96	74.	0.	143.	143.	-0.	-0.000	0.006	0.03	289.23	43.
5	96- 99	71.	0.	137.	137.	-0.	-0.000	0.006	0.03	289.23	43.
5	99-102	69.	0.	133.	133.	-0.	-0.000	0.006	0.03	289.23	43.
5	102-105	66.	0.	127.	127.	-0.	-0.000	0.006	0.03	289.23	43.
5	105-108	64.	0.	123.	123.	-0.	-0.000	0.006	0.03	289.23	43.
5	108-111	61.	0.	117.	118.	-0.	-0.000	0.006	0.03	289.23	43.
5	111-114	59.	0.	114.	114.	-0.	-0.000	0.006	0.03	289.23	43.
5	114-117	57.	0.	110.	110.	-0.	-0.000	0.006	0.03	289.23	43.
5	117-120	56.	0.	108.	108.	-0.	-0.000	0.006	0.03	289.23	43.
6	120-123	54.	0.	104.	104.	-0.	-0.000	0.006	0.03	289.23	43.
6	123-126	52.	0.	100.	100.	-0.	-0.000	0.006	0.03	289.23	43.
6	126-129	50.	0.	96.	96.	-0.	-0.000	0.006	0.03	289.23	43.
6	129-132	49.	0.	94.	94.	-0.	-0.000	0.006	0.03	289.23	43.
6	132-135	47.	0.	91.	91.	-0.	-0.000	0.006	0.03	289.23	43.
6	135-138	46.	0.	89.	89.	-0.	-0.000	0.006	0.03	289.23	43.
6	138-141	44.	0.	85.	85.	-0.	-0.000	0.006	0.03	289.23	43.
6	141-144	43.	0.	83.	83.	-0.	-0.000	0.006	0.03	289.23	43.
7	144-147	42.	0.	81.	81.	-0.	-0.000	0.006	0.03	289.23	43.
7	147-150	40.	0.	77.	77.	-0.	-0.000	0.006	0.03	289.23	43.
7	150-153	39.	0.	75.	75.	-0.	-0.000	0.006	0.03	289.23	43.
7	153-156	38.	0.	73.	73.	-0.	-0.000	0.006	0.03	289.23	43.
7	156-159	37.	0.	71.	71.	-0.	-0.000	0.006	0.03	289.23	43.
7	159-162	36.	0.	69.	69.	-0.	-0.000	0.006	0.03	289.23	43.
7	162-165	34.	0.	65.	66.	-0.	-0.000	0.006	0.03	289.23	43.
7	165-168	33.	0.	64.	64.	-0.	-0.000	0.006	0.03	289.23	43.
8	168-171	32.	0.	62.	62.	-0.	-0.000	0.006	0.03	289.23	43.
8	171-174	32.	0.	62.	62.	-0.	-0.000	0.006	0.03	289.23	43.
8	174-177	31.	0.	60.	60.	-0.	-0.000	0.006	0.03	289.23	43.
8	177-180	29.	0.	56.	56.	-0.	-0.000	0.006	0.03	289.23	43.
8	180-183	28.	0.	54.	54.	-0.	-0.000	0.006	0.03	289.23	43.
8	183-186	28.	0.	54.	54.	-0.	-0.000	0.006	0.03	289.23	43.
8	186-189	27.	0.	52.	52.	-0.	-0.000	0.006	0.03	289.23	43.
8	189-192	26.	0.	50.	50.	-0.	-0.000	0.006	0.03	289.23	43.
9	192-195	26.	0.	50.	50.	-0.	-0.000	0.006	0.03	289.23	43.
9	195-198	25.	0.	48.	48.	-0.	-0.000	0.006	0.03	289.23	43.
9	198-201	24.	0.	46.	46.	-0.	-0.000	0.006	0.03	289.23	43.
9	201-204	23.	0.	44.	44.	-0.	-0.000	0.006	0.03	289.23	43.
9	204-207	23.	0.	44.	44.	-0.	-0.000	0.006	0.03	289.23	43.
9	207-210	22.	0.	42.	42.	-0.	-0.000	0.006	0.03	289.23	43.
9	210-213	22.	0.	42.	42.	-0.	-0.000	0.006	0.03	289.23	43.
9	213-216	22.	0.	42.	42.	-0.	-0.000	0.006	0.03	289.23	43.
10	216-219	21.	0.	40.	41.	-0.	-0.000	0.006	0.03	289.23	43.
10	219-222	21.	0.	40.	41.	-0.	-0.000	0.006	0.03	289.23	43.
10	222-225	21.	0.	40.	41.	-0.	-0.000	0.006	0.03	289.23	43.
10	225-228	21.	0.	40.	41.	-0.	-0.000	0.006	0.03	289.23	43.
10	228-231	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
10	231-234	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
10	234-237	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
10	237-240	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.

Table E 3-2(1) Flood Control Simulation for Before Project on 1 to 5 Years

** PROJECT STATUS ---- BEFORE PROJECT
** RETURN PERIOD ----- 1 TO 5 YRS
** RUN DATE/TIME --- SEP. 8,1981/AM 9.3[illegible]

TIME		INFLOW AT DAM SITE	SPILLAGE FROM DAM	INFLOW TO INT.POINT	OUTFLOW INT.POINT	BALANCE INT.POINT	BALANCE INT.POINT	INUNDATED VOLUME	INUNDATED DEPTH	INUNDATED STAGE	INUNDATED AREA
DAY	HRS	(CUM/S)	(CUM/S)	(CUM/S)	(CUM/S)	(CUM/S)	(MCM)	(MCM)	(M)	(EL.M)	[illegible]
1	0- 3	20.	-	59.	59.	0.	0.000	0.001	0.01	289.21	[illegible]
1	3- 6	21.	-	61.	61.	0.	0.005	0.006	0.03	289.23	[illegible]
1	6- 9	23.	-	67.	67.	-0.	-0.000	0.006	0.03	289.23	[illegible]
1	9- 12	28.	-	82.	82.	-0.	-0.000	0.006	0.03	289.23	[illegible]
1	12- 15	34.	-	99.	100.	-0.	-0.000	0.006	0.03	289.23	[illegible]
1	15- 18	58.	-	170.	170.	-0.	-0.000	0.006	0.03	289.23	[illegible]
1	18- 21	137.	-	401.	330.	71.	0.766	0.773	0.28	289.48	[illegible]
1	21- 24	268.	-	784.	330.	454.	4.906	5.680	0.76	289.96	[illegible]
2	24- 27	329.	-	963.	330.	633.	6.834	12.514	1.12	290.32	[illegible]
2	27- 30	218.	-	638.	330.	308.	3.326	15.840	1.26	290.46	[illegible]
2	30- 33	186.	-	544.	330.	214.	2.315	18.155	1.35	290.55	[illegible]
2	33- 36	172.	-	503.	330.	173.	1.872	20.028	1.42	290.62	[illegible]
2	36- 39	174.	-	509.	330.	179.	1.935	21.964	1.49	290.69	[illegible]
2	39- 42	176.	-	515.	330.	185.	1.999	23.963	1.55	290.75	[illegible]
2	42- 45	180.	-	527.	330.	197.	2.125	26.088	1.62	290.82	[illegible]
2	45- 48	178.	-	521.	330.	191.	2.062	28.151	1.68	290.88	[illegible]
3	48- 51	177.	-	518.	330.	188.	2.030	30.181	1.74	290.94	[illegible]
3	51- 54	177.	-	518.	330.	188.	2.030	32.212	1.80	291.00	[illegible]
3	54- 57	175.	-	512.	330.	182.	1.967	34.180	1.85	291.05	[illegible]
3	57- 60	172.	-	503.	330.	173.	1.872	36.052	1.90	291.10	[illegible]
3	60- 63	173.	-	506.	330.	176.	1.904	37.956	1.95	291.15	[illegible]
3	63- 66	174.	-	509.	330.	179.	1.935	39.892	2.00	291.20	[illegible]
3	66- 69	175.	-	512.	330.	182.	1.967	41.860	2.05	291.25	[illegible]
3	69- 72	177.	-	518.	330.	188.	2.030	43.890	2.10	291.30	[illegible]
4	72- 75	176.	-	515.	330.	185.	1.999	45.890	2.15	291.35	[illegible]
4	75- 78	169.	-	495.	330.	165.	1.777	47.667	2.19	291.39	[illegible]
4	78- 81	150.	-	439.	330.	109.	1.177	48.845	2.22	291.41	[illegible]
4	81- 84	129.	-	377.	330.	47.	0.513	49.359	2.23	291.43	[illegible]
4	84- 87	123.	-	360.	330.	30.	0.324	49.683	2.23	291.43	[illegible]
4	87- 90	117.	-	342.	330.	12.	0.134	49.817	2.24	291.44	[illegible]
4	90- 93	113.	-	331.	330.	1.	0.008	49.825	2.24	291.44	[illegible]
4	93- 96	107.	-	313.	330.	-17.	-0.182	49.644	2.23	291.43	[illegible]
5	96- 99	102.	-	298.	330.	-32.	-0.340	49.304	2.23	291.43	[illegible]
5	99-102	98.	-	287.	330.	-43.	-0.466	48.838	2.21	291.41	[illegible]
5	102-105	93.	-	272.	330.	-58.	-0.624	48.214	2.20	291.40	[illegible]
5	105-108	91.	-	266.	330.	-64.	-0.688	47.527	2.19	291.39	[illegible]
5	108-111	86.	-	252.	330.	-78.	-0.846	46.682	2.17	291.37	[illegible]
5	111-114	82.	-	240.	330.	-90.	-0.972	45.710	2.14	291.34	[illegible]
5	114-117	79.	-	231.	330.	-99.	-1.067	44.644	2.12	291.32	[illegible]
5	117-120	77.	-	225.	330.	-105.	-1.130	43.514	2.09	291.29	[illegible]
6	120-123	74.	-	217.	330.	-113.	-1.225	42.290	2.06	291.26	[illegible]
6	123-126	71.	-	208.	330.	-122.	-1.320	40.971	2.03	291.23	[illegible]
6	126-129	68.	-	199.	330.	-131.	-1.415	39.557	1.99	291.19	[illegible]
6	129-132	66.	-	193.	330.	-137.	-1.478	38.079	1.96	291.16	[illegible]
6	132-135	64.	-	187.	330.	-143.	-1.541	36.539	1.92	291.12	[illegible]
6	135-138	62.	-	181.	330.	-149.	-1.604	34.935	1.87	291.07	[illegible]
6	138-141	59.	-	173.	330.	-157.	-1.699	33.237	1.83	291.03	[illegible]
6	141-144	57.	-	167.	330.	-163.	-1.762	31.475	1.78	290.98	[illegible]
7	144-147	55.	-	161.	330.	-169.	-1.825	29.650	1.73	290.93	[illegible]
7	147-150	53.	-	155.	330.	-175.	-1.889	27.762	1.67	290.87	[illegible]
7	150-153	51.	-	149.	330.	-181.	-1.952	25.811	1.61	290.81	[illegible]
7	153-156	49.	-	143.	330.	-187.	-2.015	23.797	1.55	290.75	[illegible]
7	156-159	48.	-	140.	330.	-190.	-2.047	21.751	1.48	290.68	[illegible]
7	159-162	45.	-	132.	330.	-198.	-2.141	19.610	1.41	290.61	[illegible]
7	162-165	42.	-	123.	330.	-207.	-2.236	17.374	1.32	290.52	[illegible]
7	165-168	41.	-	120.	330.	-210.	-2.268	15.107	1.23	290.43	[illegible]
8	168-171	40.	-	117.	330.	-213.	-2.299	12.808	1.14	290.34	[illegible]
8	171-174	39.	-	114.	330.	-216.	-2.331	10.477	1.03	290.23	[illegible]
8	174-177	37.	-	108.	330.	-222.	-2.394	8.084	0.90	290.10	[illegible]
8	177-180	35.	-	102.	330.	-228.	-2.457	5.627	0.76	289.95	[illegible]
8	180-183	33.	-	97.	330.	-233.	-2.521	3.107	0.56	289.76	[illegible]
8	183-186	32.	-	94.	330.	-236.	-2.552	0.555	0.24	289.44	[illegible]
8	186-189	31.	-	91.	142.	-51.	-0.549	0.006	0.03	289.23	[illegible]
8	189-192	31.	-	91.	91.	-0.	-0.001	0.006	0.03	289.23	[illegible]
9	192-195	30.	-	88.	88.	-0.	-0.000	0.006	0.03	289.23	[illegible]
9	195-198	29.	-	85.	85.	-0.	-0.000	0.006	0.03	289.23	[illegible]
9	198-201	27.	-	79.	79.	-0.	-0.000	0.006	0.03	289.23	[illegible]
9	201-204	25.	-	73.	73.	-0.	-0.000	0.006	0.03	289.23	[illegible]
9	204-207	25.	-	73.	73.	-0.	-0.000	0.006	0.03	289.23	[illegible]
9	207-210	24.	-	70.	70.	-0.	-0.000	0.006	0.03	289.23	[illegible]
9	210-213	23.	-	67.	67.	-0.	-0.000	0.006	0.03	289.23	[illegible]
9	213-216	23.	-	67.	67.	-0.	-0.000	0.006	0.03	289.23	[illegible]
10	216-219	22.	-	64.	64.	-0.	-0.000	0.006	0.03	289.23	[illegible]
10	219-222	22.	-	64.	64.	-0.	-0.000	0.006	0.03	289.23	[illegible]
10	222-225	22.	-	64.	64.	-0.	-0.000	0.006	0.03	289.23	[illegible]
10	225-228	21.	-	61.	62.	-0.	-0.000	0.006	0.03	289.23	[illegible]
10	228-231	21.	-	61.	62.	-0.	-0.000	0.006	0.03	289.23	[illegible]
10	231-234	21.	-	61.	62.	-0.	-0.000	0.006	0.03	289.23	[illegible]
10	234-237	20.	-	59.	59.	-0.	-0.000	0.006	0.03	289.23	[illegible]
10	237-240	20.	-	59.	59.	-0.	-0.000	0.006	0.03	289.23	[illegible]

Table E 3-2(2) Flood Control Simulation for After Project on 1 to 5 Years

** PROJECT STATUS ---- AFTER PROJECT
** RETURN PERIOD ----- 1 TO 5 YRS

** RUN DATE/TIME ---- SEP. 8.1981/AM 9.30

DAY	HRS	INFLOW AT DAM SITE (CUM/S)	SPILLAGE FROM DAM (CUM/S)	INFLOW TO INT.POINT (CUM/S)	OUTFLOW INT.POINT (CUM/S)	BALANCE INT.POINT (CUM/S)	BALANCE INT.POINT (MCM)	INUNDATED VOLUME (MCM)	INUNDATED DEPTH (M)	INUNDATED STAGE (EL.M)	INUNDATED AREA (HA)
1	0- 3	20.	0.	39.	39.	0.	0.000	0.001	0.01	289.21	14.
1	3- 6	21.	0.	40.	40.	0.	0.005	0.006	0.03	289.23	43.
1	6- 9	23.	0.	44.	44.	-0.	-0.000	0.006	0.03	289.23	43.
1	9- 12	28.	0.	54.	54.	-0.	-0.000	0.006	0.03	289.23	43.
1	12- 15	34.	0.	65.	66.	-0.	-0.000	0.006	0.03	289.23	43.
1	15- 18	58.	0.	112.	112.	-0.	-0.000	0.006	0.03	289.23	43.
1	18- 21	137.	0.	264.	264.	-0.	-0.000	0.006	0.03	289.23	43.
1	21- 24	268.	0.	516.	330.	186.	2.012	2.019	0.45	289.65	889.
2	24- 27	329.	0.	634.	330.	304.	3.281	5.300	0.73	289.93	1447.
2	27- 30	218.	0.	420.	330.	90.	0.972	6.272	0.80	290.00	1574.
2	30- 33	186.	0.	358.	330.	28.	0.306	6.578	0.82	290.02	1613.
2	33- 36	172.	0.	331.	330.	1.	0.015	6.593	0.82	290.02	1615.
2	36- 39	174.	0.	335.	330.	5.	0.056	6.650	0.82	290.02	1621.
2	39- 42	176.	0.	339.	330.	9.	0.098	6.748	0.83	290.03	1633.
2	42- 45	180.	0.	347.	330.	17.	0.181	6.930	0.84	290.04	1655.
2	45- 48	178.	0.	343.	330.	13.	0.139	7.069	0.85	290.05	1672.
3	48- 51	177.	0.	341.	330.	11.	0.119	7.189	0.85	290.05	1686.
3	51- 54	177.	0.	341.	330.	11.	0.119	7.308	0.86	290.06	1700.
3	54- 57	175.	0.	337.	330.	7.	0.077	7.385	0.86	290.06	1709.
3	57- 60	172.	0.	331.	330.	1.	0.015	7.400	0.87	290.07	1711.
3	60- 63	173.	0.	333.	330.	3.	0.035	7.436	0.87	290.07	1715.
3	63- 66	174.	0.	335.	330.	5.	0.056	7.493	0.87	290.07	1722.
3	66- 69	175.	0.	337.	330.	7.	0.077	7.570	0.88	290.07	1731.
3	69- 72	177.	0.	341.	330.	11.	0.119	7.689	0.88	290.08	1744.
4	72- 75	176.	0.	339.	330.	9.	0.098	7.788	0.89	290.09	1756.
4	75- 78	169.	0.	326.	330.	-4.	-0.048	7.740	0.88	290.08	1750.
4	78- 81	150.	0.	289.	330.	-41.	-0.443	7.298	0.86	290.06	1699.
4	81- 84	129.	0.	248.	330.	-82.	-0.880	6.418	0.81	290.01	1593.
4	84- 87	123.	0.	237.	330.	-93.	-1.005	5.414	0.74	289.94	1462.
4	87- 90	117.	0.	225.	330.	-105.	-1.130	4.285	0.66	289.86	1300.
4	90- 93	113.	0.	218.	330.	-112.	-1.213	3.073	0.56	289.76	1099.
4	93- 96	107.	0.	206.	330.	-124.	-1.338	1.736	0.42	289.62	824.
5	96- 99	102.	0.	196.	330.	-134.	-1.442	0.294	0.18	289.38	334.
5	99-102	98.	0.	189.	216.	-27.	-0.289	0.006	0.03	289.23	43.
5	102-105	93.	0.	179.	179.	-0.	-0.001	0.006	0.03	289.23	43.
5	105-108	91.	0.	175.	175.	-0.	-0.000	0.006	0.03	289.23	43.
5	108-111	86.	0.	166.	166.	-0.	-0.000	0.006	0.03	289.23	43.
5	111-114	82.	0.	158.	158.	-0.	-0.000	0.006	0.03	289.23	43.
5	114-117	79.	0.	152.	152.	-0.	-0.000	0.006	0.03	289.23	43.
5	117-120	77.	0.	148.	148.	-0.	-0.000	0.006	0.03	289.23	43.
6	120-123	74.	0.	143.	143.	-0.	-0.000	0.006	0.03	289.23	43.
6	123-126	71.	0.	137.	137.	-0.	-0.000	0.006	0.03	289.23	43.
6	126-129	68.	0.	131.	131.	-0.	-0.000	0.006	0.03	289.23	43.
6	129-132	66.	0.	127.	127.	-0.	-0.000	0.006	0.03	289.23	43.
6	132-135	64.	0.	123.	123.	-0.	-0.000	0.006	0.03	289.23	43.
6	135-138	62.	0.	119.	120.	-0.	-0.000	0.006	0.03	289.23	43.
6	138-141	59.	0.	114.	114.	-0.	-0.000	0.006	0.03	289.23	43.
6	141-144	57.	0.	110.	110.	-0.	-0.000	0.006	0.03	289.23	43.
7	144-147	55.	0.	106.	106.	-0.	-0.000	0.006	0.03	289.23	43.
7	147-150	53.	0.	102.	102.	-0.	-0.000	0.006	0.03	289.23	43.
7	150-153	51.	0.	98.	98.	-0.	-0.000	0.006	0.03	289.23	43.
7	153-156	49.	0.	94.	94.	-0.	-0.000	0.006	0.03	289.23	43.
7	156-159	48.	0.	92.	93.	-0.	-0.000	0.006	0.03	289.23	43.
7	159-162	45.	0.	87.	87.	-0.	-0.000	0.006	0.03	289.23	43.
7	162-165	42.	0.	81.	81.	-0.	-0.000	0.006	0.03	289.23	43.
7	165-168	41.	0.	79.	79.	-0.	-0.000	0.006	0.03	289.23	43.
8	168-171	40.	0.	77.	77.	-0.	-0.000	0.006	0.03	289.23	43.
8	171-174	39.	0.	75.	75.	-0.	-0.000	0.006	0.03	289.23	43.
8	174-177	37.	0.	71.	71.	-0.	-0.000	0.006	0.03	289.23	43.
8	177-180	35.	0.	67.	68.	-0.	-0.000	0.006	0.03	289.23	43.
8	180-183	33.	0.	64.	64.	-0.	-0.000	0.006	0.03	289.23	43.
8	183-186	32.	0.	62.	62.	-0.	-0.000	0.006	0.03	289.23	43.
8	186-189	31.	0.	60.	60.	-0.	-0.000	0.006	0.03	289.23	43.
8	189-192	31.	0.	60.	60.	-0.	-0.000	0.006	0.03	289.23	43.
9	192-195	30.	0.	58.	58.	-0.	-0.000	0.006	0.03	289.23	43.
9	195-198	29.	0.	56.	56.	-0.	-0.000	0.006	0.03	289.23	43.
9	198-201	27.	0.	52.	52.	-0.	-0.000	0.006	0.03	289.23	43.
9	201-204	25.	0.	48.	48.	-0.	-0.000	0.006	0.03	289.23	43.
9	204-207	25.	0.	48.	48.	-0.	-0.000	0.006	0.03	289.23	43.
9	207-210	24.	0.	46.	46.	-0.	-0.000	0.006	0.03	289.23	43.
9	210-213	23.	0.	44.	44.	-0.	-0.000	0.006	0.03	289.23	43.
9	213-216	23.	0.	44.	44.	-0.	-0.000	0.006	0.03	289.23	43.
10	216-219	22.	0.	42.	42.	-0.	-0.000	0.006	0.03	289.23	43.
10	219-222	22.	0.	42.	42.	-0.	-0.000	0.006	0.03	289.23	43.
10	222-225	22.	0.	42.	42.	-0.	-0.000	0.006	0.03	289.23	43.
10	225-228	21.	0.	40.	41.	-0.	-0.000	0.006	0.03	289.23	43.
10	228-231	21.	0.	40.	41.	-0.	-0.000	0.006	0.03	289.23	43.
10	231-234	21.	0.	40.	41.	-0.	-0.000	0.006	0.03	289.23	43.
10	234-237	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
10	237-240	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.

Table E 3-3(1) Flood Control Simulation for Before Project on 1 to 10 Years

** PROJECT STATUS ---- BEFORE PROJECT
** RETURN PERIOD ----- 1 TO 10 YRS ** RUN DATE/TIME --- SEP, 8,1981/AM 9.30

TIME		INFLOW AT DAM SITE	SPILLAGE FROM DAM	INFLOW TO INT.POINT	OUTFLOW INT.POINT	BALANCE INT.POINT	BALANCE INT.POINT	INUNDATED VOLUME	INUNDATED DEPTH	INUNDATED STAGE	INUNDATED AREA
DAY	HRS	(CUM/S)	(CUM/S)	(CUM/S)	(CUM/S)	(CUM/S)	(MCM)	(MCM)	(M)	(EL.M)	(HA)
1	0- 3	20.	-	59.	59.	0.	0.000	0.001	0.01	289.21	14.
1	3- 6	21.	-	61.	61.	0.	0.005	0.006	0.03	289.23	43.
1	6- 9	24.	-	70.	70.	-0.	-0.000	0.006	0.03	289.23	43.
1	9- 12	31.	-	91.	91.	-0.	-0.000	0.006	0.03	289.23	43.
1	12- 15	41.	-	120.	120.	-0.	-0.000	0.006	0.03	289.23	43.
1	15- 18	23.	-	67.	67.	-0.	-0.000	0.006	0.03	289.23	43.
1	18- 21	183.	-	535.	340.	195.	2.112	2.119	0.47	289.67	911.
1	21- 24	368.	-	1077.	340.	737.	7.958	10.078	1.01	290.21	1998.
2	24- 27	456.	-	1334.	340.	994.	10.739	20.817	1.45	290.65	2476.
2	27- 30	299.	-	875.	340.	535.	5.778	26.596	1.64	290.84	3252.
2	30- 33	244.	-	714.	340.	374.	4.040	30.636	1.76	290.96	3491.
2	33- 36	214.	-	626.	340.	286.	3.091	33.728	1.84	291.04	3664.
2	36- 39	213.	-	623.	340.	283.	3.060	36.788	1.92	291.12	3827.
2	39- 42	213.	-	623.	340.	283.	3.060	39.848	2.00	291.20	3983.
2	42- 45	214.	-	626.	340.	286.	3.091	42.940	2.08	291.28	4135.
2	45- 48	209.	-	612.	340.	272.	2.933	45.874	2.15	291.35	4274.
3	48- 51	205.	-	600.	340.	260.	2.807	48.682	2.21	291.41	4403.
3	51- 54	204.	-	597.	340.	257.	2.775	51.458	2.27	291.47	4527.
3	54- 57	204.	-	597.	340.	257.	2.775	54.234	2.33	291.53	4640.
3	57- 60	204.	-	597.	340.	257.	2.775	57.010	2.39	291.59	4765.
3	60- 63	204.	-	597.	340.	257.	2.775	59.786	2.45	291.65	4882.
3	63- 66	205.	-	600.	340.	260.	2.807	62.593	2.51	291.71	4994.
3	66- 69	206.	-	603.	340.	263.	2.839	65.432	2.56	291.76	5106.
3	69- 72	209.	-	612.	340.	272.	2.933	68.366	2.62	291.82	5223.
4	72- 75	208.	-	609.	340.	269.	2.902	71.269	2.67	291.87	5333.
4	75- 78	199.	-	582.	340.	242.	2.617	73.887	2.72	291.92	5427.
4	78- 81	177.	-	518.	340.	178.	1.922	75.809	2.76	291.96	5497.
4	81- 84	152.	-	445.	340.	105.	1.132	76.942	2.78	291.98	5535.
4	84- 87	145.	-	424.	340.	84.	0.911	77.853	2.80	292.00	5571.
4	87- 90	137.	-	401.	340.	61.	0.658	78.512	2.81	292.01	5595.
4	90- 93	133.	-	389.	340.	49.	0.532	79.044	2.82	292.02	5613.
4	93- 96	126.	-	369.	340.	29.	0.310	79.355	2.82	292.02	5625.
5	96- 99	119.	-	348.	340.	8.	0.089	79.445	2.82	292.02	5628.
5	99-102	114.	-	334.	340.	-6.	-0.069	79.376	2.82	292.02	5625.
5	102-105	109.	-	319.	340.	-21.	-0.227	79.150	2.82	292.02	5617.
5	105-108	106.	-	310.	340.	-30.	-0.322	78.829	2.81	292.01	5606.
5	108-111	100.	-	293.	340.	-47.	-0.511	78.318	2.80	292.00	5581.
5	111-114	95.	-	278.	340.	-62.	-0.669	77.650	2.79	291.99	5564.
5	114-117	92.	-	269.	340.	-71.	-0.764	76.886	2.78	291.98	5536.
5	117-120	89.	-	260.	340.	-80.	-0.859	76.028	2.76	291.96	5505.
6	120-123	85.	-	249.	340.	-91.	-0.985	75.043	2.74	291.94	5469.
6	123-126	82.	-	240.	340.	-100.	-1.080	73.963	2.72	291.92	5435.
6	126-129	78.	-	228.	340.	-112.	-1.206	72.757	2.70	291.90	5385.
6	129-132	75.	-	219.	340.	-121.	-1.301	71.456	2.68	291.88	5337.
6	132-135	73.	-	214.	340.	-126.	-1.364	70.092	2.65	291.85	5286.
6	135-138	71.	-	208.	340.	-132.	-1.428	68.665	2.63	291.83	5231.
6	138-141	67.	-	196.	340.	-144.	-1.554	67.112	2.60	291.80	5172.
6	141-144	65.	-	190.	340.	-150.	-1.617	65.495	2.56	291.76	5104.
7	144-147	63.	-	184.	340.	-156.	-1.681	63.815	2.53	291.73	5043.
7	147-150	59.	-	173.	340.	-167.	-1.807	62.008	2.50	291.70	4971.
7	150-153	57.	-	167.	340.	-173.	-1.870	60.139	2.46	291.66	4895.
7	153-156	56.	-	164.	340.	-176.	-1.902	58.237	2.42	291.62	4817.
7	156-159	54.	-	158.	340.	-182.	-1.965	56.273	2.38	291.58	4735.
7	159-162	51.	-	149.	340.	-191.	-2.060	54.214	2.33	291.53	4667.
7	162-165	47.	-	138.	340.	-202.	-2.186	52.028	2.29	291.49	4558.
7	165-168	45.	-	132.	340.	-208.	-2.249	49.779	2.24	291.44	4451.
8	168-171	43.	-	126.	340.	-214.	-2.313	47.467	2.18	291.38	4344.
8	171-174	42.	-	123.	340.	-217.	-2.344	45.123	2.13	291.33	4233.
8	174-177	41.	-	120.	340.	-220.	-2.376	42.748	2.07	291.27	4126.
8	177-180	37.	-	108.	340.	-232.	-2.502	40.246	2.01	291.21	4003.
8	180-183	36.	-	105.	340.	-235.	-2.534	37.713	1.95	291.15	3874.
8	183-186	34.	-	99.	340.	-241.	-2.597	35.116	1.88	291.08	3735.
8	186-189	33.	-	97.	340.	-243.	-2.629	32.488	1.81	291.01	3595.
8	189-192	32.	-	94.	340.	-246.	-2.660	29.828	1.73	290.93	3443.
9	192-195	31.	-	91.	340.	-249.	-2.692	27.137	1.65	290.85	3283.
9	195-198	31.	-	91.	340.	-249.	-2.692	24.446	1.57	290.77	3114.
9	198-201	28.	-	82.	340.	-258.	-2.787	21.660	1.48	290.68	2934.
9	201-204	26.	-	76.	340.	-264.	-2.850	18.810	1.38	290.58	2734.
9	204-207	25.	-	73.	340.	-267.	-2.881	15.929	1.27	290.47	2515.
9	207-210	25.	-	73.	340.	-267.	-2.881	13.048	1.15	290.35	2275.
9	210-213	24.	-	70.	340.	-270.	-2.913	10.136	1.01	290.21	2004.
9	213-216	23.	-	67.	340.	-273.	-2.945	7.192	0.85	290.05	1617.
10	216-219	23.	-	67.	340.	-273.	-2.945	4.248	0.66	289.86	1294.
10	219-222	22.	-	64.	340.	-276.	-2.976	1.272	0.36	289.56	734.
10	222-225	22.	-	64.	182.	-117.	-1.266	0.006	0.03	289.23	43.
10	225-228	21.	-	61.	62.	-0.	-0.001	0.006	0.03	289.23	43.
10	228-231	21.	-	61.	62.	-0.	-0.000	0.006	0.03	289.23	43.
10	231-234	21.	-	61.	62.	-0.	-0.000	0.006	0.03	289.23	43.
10	234-237	21.	-	61.	62.	-0.	-0.000	0.006	0.03	289.23	43.
10	237-240	20.	-	59.	59.	-0.	-0.000	0.006	0.03	289.23	43.

Table E 3-3(2) Flood Control Simulation for After Project on 1 to 10 Years

** PROJECT STATUS ---- AFTER PROJECT
** RETURN PERIOD ----- 1 TO 10 YRS

** RUN DATE/TIME --- SEP. 8,1981/AM 9.30

TIME DAY	HRS	INFLOW AT DAM SITE (CUM/S)	SPILLAGE FROM DAM (CUM/S)	INFLOW TO INT.POINT (CUM/S)	OUTFLOW INT.POINT (CUM/S)	BALANCE INT.POINT (CUM/S)	BALANCE INT.POINT (MCM)	INUNDATED VOLUME (MCM)	INUNDATED DEPTH (M)	INUNDATED STAGE (EL.M)	INUNDATED AREA (HA)
1	0- 3	20.	0.	39.	39.	0.	0.000	0.001	0.01	289.21	14.
1	3- 6	21.	0.	40.	40.	0.	0.005	0.006	0.03	289.23	43.
1	6- 9	24.	0.	46.	46.	-0.	-0.000	0.006	0.03	289.23	43.
1	9- 12	31.	0.	60.	60.	-0.	-0.000	0.006	0.03	289.23	43.
1	12- 15	41.	0.	79.	79.	-0.	-0.000	0.006	0.03	289.23	43.
1	15- 18	23.	0.	44.	44.	-0.	-0.000	0.006	0.03	289.23	43.
1	18- 21	183.	0.	352.	340.	12.	0.135	0.142	0.12	289.32	229.
1	21- 24	368.	0.	709.	340.	369.	3.984	4.127	0.65	289.85	1275.
2	24- 27	456.	0.	878.	340.	538.	5.815	9.942	1.00	290.20	1985.
2	27- 30	299.	0.	576.	340.	236.	2.549	12.491	1.12	290.32	2226.
2	30- 33	244.	0.	470.	340.	130.	1.404	13.896	1.18	290.38	2348.
2	33- 36	214.	0.	412.	340.	72.	0.780	14.677	1.22	290.42	2413.
2	36- 39	213.	0.	410.	340.	70.	0.759	15.437	1.25	290.45	2475.
2	39- 42	213.	0.	410.	340.	70.	0.759	16.197	1.28	290.48	2536.
2	42- 45	214.	0.	412.	340.	72.	0.780	16.977	1.31	290.51	2596.
2	45- 48	209.	0.	403.	340.	63.	0.676	17.654	1.33	290.53	2646.
3	48- 51	205.	0.	395.	340.	55.	0.593	18.248	1.36	290.56	2692.
3	51- 54	204.	0.	393.	340.	53.	0.572	18.820	1.38	290.58	2734.
3	54- 57	204.	0.	393.	340.	53.	0.572	19.393	1.40	290.60	2776.
3	57- 60	204.	0.	393.	340.	53.	0.572	19.966	1.42	290.62	2817.
3	60- 63	204.	0.	393.	340.	53.	0.572	20.539	1.44	290.64	2857.
3	63- 66	205.	0.	395.	340.	55.	0.593	21.132	1.46	290.66	2898.
3	66- 69	206.	0.	397.	340.	57.	0.614	21.747	1.48	290.68	2940.
3	69- 72	209.	0.	403.	340.	63.	0.676	22.423	1.50	290.70	2985.
4	72- 75	208.	0.	401.	340.	61.	0.655	23.079	1.52	290.72	3029.
4	75- 78	199.	0.	383.	340.	43.	0.468	23.548	1.54	290.74	3060.
4	78- 81	177.	0.	341.	340.	1.	0.011	23.559	1.54	290.74	3060.
4	81- 84	152.	0.	293.	340.	-47.	-0.509	23.050	1.52	290.72	3027.
4	84- 87	145.	0.	279.	340.	-61.	-0.655	22.395	1.50	290.70	2984.
4	87- 90	137.	0.	264.	340.	-76.	-0.822	21.574	1.47	290.67	2928.
4	90- 93	133.	0.	256.	340.	-84.	-0.905	20.670	1.44	290.64	2866.
4	93- 96	126.	0.	243.	340.	-97.	-1.050	19.620	1.41	290.61	2792.
5	96- 99	119.	0.	229.	340.	-111.	-1.196	18.425	1.36	290.56	2705.
5	99-102	114.	0.	220.	340.	-120.	-1.300	17.125	1.31	290.51	2608.
5	102-105	109.	0.	210.	340.	-130.	-1.404	15.722	1.26	290.46	2498.
5	105-108	106.	0.	204.	340.	-136.	-1.466	14.256	1.20	290.40	2379.
5	108-111	100.	0.	193.	340.	-147.	-1.591	12.665	1.13	290.33	2241.
5	111-114	95.	0.	183.	340.	-157.	-1.695	10.971	1.05	290.25	2085.
5	114-117	92.	0.	177.	340.	-163.	-1.758	9.213	0.96	290.16	1910.
5	117-120	89.	0.	171.	340.	-169.	-1.820	7.394	0.86	290.06	1710.
6	120-123	85.	0.	164.	340.	-176.	-1.903	5.491	0.75	289.95	1473.
6	123-126	82.	0.	158.	340.	-182.	-1.966	3.526	0.60	289.80	1178.
6	126-129	78.	0.	150.	340.	-190.	-2.049	1.478	0.39	289.59	759.
6	129-132	75.	0.	144.	281.	-136.	-1.472	0.006	0.03	289.23	43.
6	132-135	73.	0.	141.	141.	-0.	-0.001	0.006	0.03	289.23	43.
6	135-138	71.	0.	137.	137.	-0.	-0.000	0.006	0.03	289.23	43.
6	138-141	67.	0.	129.	129.	-0.	-0.000	0.006	0.03	289.23	43.
6	141-144	65.	0.	125.	125.	-0.	-0.000	0.006	0.03	289.23	43.
7	144-147	63.	0.	121.	121.	-0.	-0.000	0.006	0.03	289.23	43.
7	147-150	59.	0.	114.	114.	-0.	-0.000	0.006	0.03	289.23	43.
7	150-153	57.	0.	110.	110.	-0.	-0.000	0.006	0.03	289.23	43.
7	153-156	56.	0.	108.	108.	-0.	-0.000	0.006	0.03	289.23	43.
7	156-159	54.	0.	104.	104.	-0.	-0.000	0.006	0.03	289.23	43.
7	159-162	51.	0.	98.	98.	-0.	-0.000	0.006	0.03	289.23	43.
7	162-165	47.	0.	91.	91.	-0.	-0.000	0.006	0.03	289.23	43.
7	165-168	45.	0.	87.	87.	-0.	-0.000	0.006	0.03	289.23	43.
8	168-171	43.	0.	83.	83.	-0.	-0.000	0.006	0.03	289.23	43.
8	171-174	42.	0.	81.	81.	-0.	-0.000	0.006	0.03	289.23	43.
8	174-177	41.	0.	79.	79.	-0.	-0.000	0.006	0.03	289.23	43.
8	177-180	37.	0.	71.	71.	-0.	-0.000	0.006	0.03	289.23	43.
8	180-183	36.	0.	69.	69.	-0.	-0.000	0.006	0.03	289.23	43.
8	183-186	34.	0.	65.	66.	-0.	-0.000	0.006	0.03	289.23	43.
8	186-189	33.	0.	64.	64.	-0.	-0.000	0.006	0.03	289.23	43.
8	189-192	32.	0.	62.	62.	-0.	-0.000	0.006	0.03	289.23	43.
9	192-195	31.	0.	60.	60.	-0.	-0.000	0.006	0.03	289.23	43.
9	195-198	31.	0.	60.	60.	-0.	-0.000	0.006	0.03	289.23	43.
9	198-201	28.	0.	54.	54.	-0.	-0.000	0.006	0.03	289.23	43.
9	201-204	26.	0.	50.	50.	-0.	-0.000	0.006	0.03	289.23	43.
9	204-207	25.	0.	48.	48.	-0.	-0.000	0.006	0.03	289.23	43.
9	207-210	25.	0.	48.	48.	-0.	-0.000	0.006	0.03	289.23	43.
9	210-213	24.	0.	46.	46.	-0.	-0.000	0.006	0.03	289.23	43.
9	213-216	23.	0.	44.	44.	-0.	-0.000	0.006	0.03	289.23	43.
10	216-219	23.	0.	44.	44.	-0.	-0.000	0.006	0.03	289.23	43.
10	219-222	22.	0.	42.	42.	-0.	-0.000	0.006	0.03	289.23	43.
10	222-225	22.	0.	42.	42.	-0.	-0.000	0.006	0.03	289.23	43.
10	225-228	21.	0.	40.	41.	-0.	-0.000	0.006	0.03	289.23	43.
10	228-231	21.	0.	40.	41.	-0.	-0.000	0.006	0.03	289.23	43.
10	231-234	21.	0.	40.	41.	-0.	-0.000	0.006	0.03	289.23	43.
10	234-237	21.	0.	40.	41.	-0.	-0.000	0.006	0.03	289.23	43.
10	237-240	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.

Table E 3-4(1) Flood Control Simulation for Before Project on 1 to 20 Years

** PROJECT STATUS ---- BEFORE PROJECT
** RETURN PERIOD ----- 1 TO 20 YRS

** RUN DATE/TIME --- SEP. 8,1981/AM 9.3

TIME DAY	TIME HRS	INFLOW AT DAM SITE (CUM/S)	SPILLAGE FROM DAM (CUM/S)	INFLOW TO INT.POINT (CUM/S)	OUTFLOW INT.POINT (CUM/S)	BALANCE INT.POINT (CUM/S)	BALANCE INT.POINT (MCM)	INUNDATED VOLUME (MCM)	INUNDATED DEPTH (M)	INUNDATED STAGE (EL.M)	INUNDATED AREA (HA)
1	0- 3	20.	-	59.	59.	0.	0.000	0.001	0.01	289.21	34.
1	3- 6	21.	-	61.	61.	0.	0.005	0.006	0.03	289.23	43.
1	6- 9	26.	-	76.	76.	-0.	-0.000	0.006	0.03	289.23	43.
1	9- 12	35.	-	102.	103.	-0.	-0.000	0.006	0.03	289.23	43.
1	12- 15	48.	-	140.	141.	-0.	-0.000	0.006	0.03	289.23	43.
1	15- 18	92.	-	269.	269.	-0.	-0.000	0.006	0.03	289.23	43.
1	18- 21	241.	-	705.	350.	355.	3.837	3.844	0.62	289.82	1231.
1	21- 24	492.	-	1440.	350.	1090.	11.769	15.613	1.25	290.45	2495.
2	24- 27	612.	-	1791.	350.	1441.	15.561	31.175	1.77	290.97	3522.
2	27- 30	397.	-	1162.	350.	812.	8.767	39.942	2.00	291.20	3918.
2	30- 33	313.	-	916.	350.	566.	6.112	46.055	2.15	291.35	4263.
2	33- 36	263.	-	770.	350.	420.	4.532	50.588	2.25	291.45	4509.
2	36- 39	259.	-	758.	350.	408.	4.406	54.994	2.35	291.55	4681.
2	39- 42	255.	-	746.	350.	396.	4.279	59.273	2.44	291.64	4919.
2	42- 45	255.	-	746.	350.	396.	4.279	63.553	2.53	291.73	5032.
2	45- 48	245.	-	717.	350.	367.	3.963	67.517	2.60	291.80	5187.
3	48- 51	237.	-	694.	350.	344.	3.710	71.228	2.67	291.87	5329.
3	51- 54	233.	-	682.	350.	332.	3.584	74.812	2.74	291.94	5461.
3	54- 57	232.	-	679.	350.	329.	3.552	78.365	2.80	292.00	5589.
3	57- 60	231.	-	676.	350.	326.	3.521	81.886	2.87	292.07	5726.
3	60- 63	230.	-	673.	350.	323.	3.489	85.376	2.93	292.13	5834.
3	63- 66	228.	-	667.	350.	317.	3.426	88.802	2.98	292.18	5950.
3	66- 69	227.	-	664.	350.	314.	3.394	92.197	3.04	292.24	6063.
3	69- 72	229.	-	670.	350.	320.	3.458	95.655	3.10	292.30	6176.
4	72- 75	227.	-	664.	350.	314.	3.394	99.050	3.15	292.35	6285.
4	75- 78	216.	-	632.	350.	282.	3.047	102.097	3.20	292.40	6381.
4	78- 81	194.	-	568.	350.	218.	2.351	104.449	3.24	292.44	6454.
4	81- 84	169.	-	495.	350.	145.	1.561	106.011	3.26	292.46	6502.
4	84- 87	161.	-	471.	350.	121.	1.309	107.320	3.28	292.48	6542.
4	87- 90	153.	-	448.	350.	98.	1.056	108.376	3.30	292.50	6575.
4	90- 93	148.	-	433.	350.	83.	0.898	109.274	3.31	292.51	6602.
4	93- 96	140.	-	410.	350.	60.	0.645	109.920	3.32	292.52	6621.
5	96- 99	133.	-	389.	350.	39.	0.424	110.344	3.33	292.53	6634.
5	99-102	128.	-	375.	350.	25.	0.266	110.610	3.33	292.53	6641.
5	102-105	121.	-	354.	350.	4.	0.044	110.655	3.33	292.53	6643.
5	105-108	118.	-	345.	350.	-5.	-0.050	110.605	3.33	292.53	6642.
5	108-111	111.	-	325.	350.	-25.	-0.272	110.334	3.33	292.53	6636.
5	111-114	105.	-	307.	350.	-43.	-0.461	109.873	3.32	292.52	6620.
5	114-117	101.	-	296.	350.	-54.	-0.588	109.286	3.31	292.51	6602.
5	117-120	99.	-	290.	350.	-60.	-0.651	108.636	3.30	292.50	6582.
6	120-123	94.	-	275.	350.	-75.	-0.809	107.827	3.29	292.49	6551.
6	123-126	91.	-	266.	350.	-84.	-0.904	106.924	3.27	292.47	6533.
6	126-129	85.	-	249.	350.	-101.	-1.093	105.831	3.26	292.46	6497.
6	129-132	83.	-	243.	350.	-107.	-1.156	104.675	3.24	292.44	6461.
6	132-135	80.	-	234.	350.	-116.	-1.251	103.424	3.22	292.42	6422.
6	135-138	78.	-	228.	350.	-122.	-1.314	102.110	3.20	292.40	6381.
6	138-141	73.	-	214.	350.	-136.	-1.472	100.638	3.18	292.38	6335.
6	141-144	71.	-	208.	350.	-142.	-1.536	99.103	3.15	292.35	6287.
7	144-147	69.	-	202.	350.	-148.	-1.599	97.505	3.13	292.33	6236.
7	147-150	64.	-	187.	350.	-163.	-1.757	95.748	3.10	292.30	6179.
7	150-153	62.	-	181.	350.	-169.	-1.820	93.929	3.07	292.27	6123.
7	153-156	60.	-	176.	350.	-174.	-1.883	92.046	3.04	292.24	6051.
7	156-159	59.	-	173.	350.	-177.	-1.915	90.131	3.01	292.21	5995.
7	159-162	54.	-	158.	350.	-192.	-2.073	88.059	2.97	292.17	5921.
7	162-165	49.	-	143.	350.	-207.	-2.231	85.828	2.93	292.13	5852.
7	165-168	47.	-	138.	350.	-212.	-2.294	83.535	2.90	292.09	5777.
8	168-171	45.	-	132.	350.	-218.	-2.357	81.178	2.85	292.05	5619.
8	171-174	44.	-	129.	350.	-221.	-2.389	78.789	2.81	292.01	5574.
8	174-177	43.	-	126.	350.	-224.	-2.421	76.369	2.77	291.97	5518.
8	177-180	39.	-	114.	350.	-236.	-2.547	73.823	2.72	291.92	5425.
8	180-183	37.	-	108.	350.	-242.	-2.610	71.213	2.67	291.87	5320.
8	183-186	35.	-	102.	350.	-248.	-2.673	68.540	2.62	291.82	5227.
8	186-189	34.	-	99.	350.	-251.	-2.705	65.836	2.57	291.77	5122.
8	189-192	33.	-	97.	350.	-253.	-2.737	63.100	2.52	291.72	5014.
9	192-195	32.	-	94.	350.	-256.	-2.768	60.332	2.46	291.66	4903.
9	195-198	31.	-	91.	350.	-259.	-2.800	57.532	2.40	291.60	4788.
9	198-201	28.	-	82.	350.	-268.	-2.895	54.638	2.34	291.54	4665.
9	201-204	26.	-	76.	350.	-274.	-2.958	51.681	2.28	291.48	4537.
9	204-207	25.	-	73.	350.	-277.	-2.989	48.692	2.21	291.41	4404.
9	207-210	24.	-	70.	350.	-280.	-3.021	45.672	2.14	291.34	4289.
9	210-213	24.	-	70.	350.	-280.	-3.021	42.651	2.07	291.27	4121.
9	213-216	23.	-	67.	350.	-283.	-3.053	39.599	1.99	291.19	3979.
10	216-219	22.	-	64.	350.	-286.	-3.084	36.515	1.92	291.12	3812.
10	219-222	22.	-	64.	350.	-286.	-3.084	33.431	1.83	291.03	3647.
10	222-225	22.	-	64.	350.	-286.	-3.084	30.348	1.75	290.95	3475.
10	225-228	21.	-	61.	350.	-289.	-3.116	27.232	1.66	290.85	3291.
10	228-231	21.	-	61.	350.	-289.	-3.116	24.117	1.56	290.76	3096.
10	231-234	21.	-	61.	350.	-289.	-3.116	21.001	1.45	290.65	2881.
10	234-237	20.	-	59.	350.	-291.	-3.147	17.855	1.34	290.54	2663.
10	237-240	20.	-	59.	350.	-291.	-3.147	14.708	1.22	290.42	2414.

Table E 5-4(2) Flood Control Simulation for After Project on 1 to 20 Years

** PROJECT STATUS ---- AFTER PROJECT
** RETURN PERIOD ----- 1 TO 20 YRS

** RUN DATE/TIME --- SEP. 8,1981/AM 9.30

TIME DAY	TIME HRS	INFLOW AT DAM SITE (CUM/S)	SPILLAGE FROM DAM (CUM/S)	INFLOW TO INT.POINT (CUM/S)	OUTFLOW INT.POINT (CUM/S)	BALANCE INT.POINT (CUM/S)	BALANCE INT.POINT (MCM)	INUNDATED VOLUME (MCM)	INUNDATED DEPTH (M)	INUNDATED STAGE (EL.M)	INUNDATED AREA (HA)
1	0- 3	20.	0.	39.	39.	0.	0.000	0.001	0.01	289.21	14.
1	3- 6	21.	0.	40.	40.	0.	0.005	0.006	0.03	289.23	43.
1	6- 9	26.	0.	50.	50.	-0.	-0.000	0.006	0.03	289.23	43.
1	9- 12	35.	0.	67.	68.	-0.	-0.000	0.006	0.03	289.23	43.
1	12- 15	48.	0.	92.	93.	-0.	-0.000	0.006	0.03	289.23	43.
1	15- 18	92.	0.	177.	177.	-0.	-0.000	0.006	0.03	289.23	43.
1	18- 21	241.	0.	464.	350.	114.	1.234	1.241	0.36	289.56	695.
1	21- 24	492.	0.	948.	350.	598.	6.455	7.697	0.88	290.08	1745.
2	24- 27	612.	0.	1179.	350.	829.	8.952	16.649	1.30	290.50	2571.
2	27- 30	397.	0.	765.	350.	415.	4.479	21.129	1.46	290.66	2898.
2	30- 33	313.	0.	603.	350.	253.	2.732	23.861	1.55	290.75	3080.
2	33- 36	263.	0.	507.	350.	157.	1.692	25.553	1.60	290.80	3188.
2	36- 39	259.	0.	499.	350.	149.	1.608	27.162	1.65	290.85	3287.
2	39- 42	255.	0.	491.	350.	141.	1.525	28.688	1.70	290.90	3378.
2	42- 45	255.	0.	491.	350.	141.	1.525	30.214	1.74	290.94	3467.
2	45- 48	245.	0.	472.	350.	122.	1.317	31.531	1.78	290.98	3542.
3	48- 51	237.	0.	457.	350.	107.	1.151	32.682	1.81	291.01	3606.
3	51- 54	233.	0.	449.	350.	99.	1.068	33.750	1.84	291.04	3665.
3	54- 57	232.	0.	447.	350.	97.	1.047	34.798	1.87	291.07	3721.
3	57- 60	231.	0.	445.	350.	95.	1.026	35.824	1.90	291.10	3776.
3	60- 63	230.	0.	443.	350.	93.	1.005	36.830	1.92	291.12	3829.
3	63- 66	228.	0.	439.	350.	89.	0.964	37.794	1.95	291.15	3879.
3	66- 69	227.	0.	437.	350.	87.	0.943	38.737	1.97	291.17	3927.
3	69- 72	229.	0.	441.	350.	91.	0.984	39.722	2.00	291.20	3977.
4	72- 75	227.	0.	437.	350.	87.	0.943	40.665	2.02	291.22	4024.
4	75- 78	216.	0.	416.	350.	66.	0.714	41.379	2.04	291.24	4059.
4	78- 81	194.	0.	374.	350.	24.	0.256	41.636	2.05	291.25	4072.
4	81- 84	169.	0.	326.	350.	-24.	-0.264	41.373	2.04	291.24	4059.
4	84- 87	161.	0.	310.	350.	-40.	-0.430	40.943	2.03	291.23	4037.
4	87- 90	153.	0.	295.	350.	-55.	-0.597	40.347	2.01	291.21	4008.
4	90- 93	148.	0.	285.	350.	-65.	-0.701	39.647	2.00	291.20	3973.
4	93- 96	140.	0.	270.	350.	-80.	-0.867	38.780	1.97	291.17	3929.
5	96- 99	133.	0.	256.	350.	-94.	-1.013	37.768	1.95	291.15	3877.
5	99-102	128.	0.	247.	350.	-103.	-1.117	36.651	1.92	291.12	3819.
5	102-105	121.	0.	233.	350.	-117.	-1.262	35.390	1.89	291.09	3753.
5	105-108	118.	0.	227.	350.	-123.	-1.325	34.065	1.85	291.05	3682.
5	108-111	111.	0.	214.	350.	-136.	-1.470	32.595	1.81	291.01	3601.
5	111-114	105.	0.	202.	350.	-148.	-1.595	31.001	1.77	290.97	3512.
5	114-117	101.	0.	195.	350.	-155.	-1.678	29.323	1.72	290.92	3415.
5	117-120	99.	0.	191.	350.	-159.	-1.720	27.603	1.67	290.87	3313.
6	120-123	94.	0.	181.	350.	-169.	-1.824	25.780	1.61	290.81	3202.
6	123-126	91.	0.	175.	350.	-175.	-1.886	23.894	1.55	290.75	3082.
6	126-129	85.	0.	164.	350.	-186.	-2.011	21.883	1.48	290.68	2949.
6	129-132	83.	0.	160.	350.	-190.	-2.053	19.831	1.41	290.61	2807.
6	132-135	80.	0.	154.	350.	-196.	-2.115	17.716	1.34	290.54	2653.
6	135-138	78.	0.	150.	350.	-700.	-2.157	15.559	1.25	290.45	2485.
6	138-141	73.	0.	141.	350.	-209.	-2.261	13.299	1.16	290.36	2297.
6	141-144	71.	0.	137.	350.	-213.	-2.302	10.997	1.05	290.25	2088.
7	144-147	69.	0.	133.	350.	-217.	-2.344	8.653	0.94	290.14	1851.
7	147-150	64.	0.	123.	350.	-227.	-2.448	6.206	0.79	289.99	1566.
7	150-153	62.	0.	119.	350.	-231.	-2.490	3.716	0.61	289.81	1210.
7	153-156	60.	0.	116.	350.	-234.	-2.531	1.186	0.35	289.55	679.
7	156-159	59.	0.	114.	223.	-109.	-1.180	0.006	0.03	289.23	43.
7	159-162	54.	0.	104.	104.	-0.	-0.001	0.006	0.03	289.23	43.
7	162-165	49.	0.	94.	94.	-0.	-0.000	0.006	0.03	289.23	43.
7	165-168	47.	0.	91.	91.	-0.	-0.000	0.006	0.03	289.23	43.
8	168-171	45.	0.	87.	87.	-0.	-0.000	0.006	0.03	289.23	43.
8	171-174	44.	0.	85.	85.	-0.	-0.000	0.006	0.03	289.23	43.
8	174-177	43.	0.	83.	83.	-0.	-0.000	0.006	0.03	289.23	43.
8	177-180	39.	0.	75.	75.	-0.	-0.000	0.006	0.03	289.23	43.
8	180-183	37.	0.	71.	71.	-0.	-0.000	0.006	0.03	289.23	43.
8	183-186	35.	0.	67.	68.	-0.	-0.000	0.006	0.03	289.23	43.
8	186-189	34.	0.	65.	66.	-0.	-0.000	0.006	0.03	289.23	43.
8	189-192	33.	0.	64.	64.	-0.	-0.000	0.006	0.03	289.23	43.
9	192-195	32.	0.	62.	62.	-0.	-0.000	0.006	0.03	289.23	43.
9	195-198	31.	0.	60.	60.	-0.	-0.000	0.006	0.03	289.23	43.
9	198-201	28.	0.	54.	54.	-0.	-0.000	0.006	0.03	289.23	43.
9	201-204	26.	0.	50.	50.	-0.	-0.000	0.006	0.03	289.23	43.
9	204-207	25.	0.	48.	48.	-0.	-0.000	0.006	0.03	289.23	43.
9	207-210	24.	0.	46.	46.	-0.	-0.000	0.006	0.03	289.23	43.
9	210-213	24.	0.	46.	46.	-0.	-0.000	0.006	0.03	289.23	43.
9	213-216	23.	0.	44.	44.	-0.	-0.000	0.006	0.03	289.23	43.
10	216-219	22.	0.	42.	42.	-0.	-0.000	0.006	0.03	289.23	43.
10	219-222	22.	0.	42.	42.	-0.	-0.000	0.006	0.03	289.23	43.
10	222-225	22.	0.	42.	42.	-0.	-0.000	0.006	0.03	289.23	43.
10	225-228	21.	0.	40.	41.	-0.	-0.000	0.006	0.03	289.23	43.
10	228-231	21.	0.	40.	41.	-0.	-0.000	0.006	0.03	289.23	43.
10	231-234	21.	0.	40.	41.	-0.	-0.000	0.006	0.03	289.23	43.
10	234-237	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	789.23	43.
10	237-240	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.

Table E 3-5(1) Flood Control Simulation for Before Project on 1 to 50 Years

** PROJECT STATUS ---- BEFORE PROJECT
** RETURN PERIOD ----- 1 TO 50 YRS
** RUN DATE/TIME --- SEP, 8,1981/AM 9,39

TIME		INFLOW AT DAM SITE	SPILLAGE FROM DAM	INFLOW TO INT.POINT	OUTFLOW INT.POINT	BALANCE INT.POINT	BALANCE INT.POINT	INUNDATED VOLUME	INUNDATED DEPTH	INUNDATED STAGE	INUNDATED AREA
DAY	HRS	(CUM/S)	(CUM/S)	(CUM/S)	(CUM/S)	(CUM/S)	(MCM)	(MCM)	(M)	(EL.M)	(HA)
1	0- 3	20.	-	59.	59.	0.	0.000	0.001	0.01	289.21	14.
1	3- 6	22.	-	64.	64.	0.	0.005	0.006	0.03	289.23	43.
1	6- 9	29.	-	85.	85.	-0.	-0.000	0.006	0.03	289.23	43.
1	9- 12	42.	-	123.	123.	-0.	-0.000	0.006	0.03	289.23	43.
1	12- 15	60.	-	176.	176.	-0.	-0.000	0.006	0.03	289.23	43.
1	15- 18	124.	-	363.	363.	-0.	-0.000	0.006	0.03	289.23	43.
1	18- 21	341.	-	998.	370.	628.	6.781	6.788	0.83	290.03	1638.
1	21- 24	698.	-	2042.	370.	1672.	18.063	24.852	1.58	290.78	3143.
2	24- 27	861.	-	2519.	370.	2149.	23.214	48.067	2.20	291.40	4375.
2	27- 30	538.	-	1574.	370.	1204.	13.007	61.074	2.48	291.68	4933.
2	30- 33	409.	-	1197.	370.	827.	8.930	70.004	2.65	291.85	5282.
2	33- 36	331.	-	969.	370.	599.	6.465	76.470	2.77	291.97	5521.
2	36- 39	319.	-	933.	370.	563.	6.086	82.556	2.88	292.08	5737.
2	39- 42	309.	-	904.	370.	534.	5.770	88.326	2.98	292.18	5934.
2	42- 45	303.	-	887.	370.	517.	5.580	93.907	3.07	292.27	6114.
2	45- 48	285.	-	834.	370.	464.	5.011	98.919	3.15	292.35	6281.
3	48- 51	268.	-	784.	370.	414.	4.474	103.393	3.22	292.42	6421.
3	51- 54	260.	-	761.	370.	391.	4.221	107.615	3.29	292.49	6551.
3	54- 57	255.	-	744.	370.	376.	4.063	111.679	3.35	292.55	6674.
3	57- 60	251.	-	734.	370.	364.	3.937	115.616	3.41	292.60	6791.
3	60- 63	246.	-	720.	370.	350.	3.779	119.395	3.46	292.66	6901.
3	63- 66	241.	-	705.	370.	335.	3.621	123.017	3.51	292.71	7005.
3	66- 69	237.	-	694.	370.	324.	3.494	126.511	3.56	292.76	7104.
3	69- 72	237.	-	694.	370.	324.	3.494	130.006	3.61	292.81	7202.
4	72- 75	232.	-	679.	370.	309.	3.336	133.343	3.66	292.86	7294.
4	75- 78	221.	-	647.	370.	277.	2.989	136.332	3.70	292.90	7375.
4	78- 81	202.	-	591.	370.	221.	2.388	138.721	3.73	292.93	7440.
4	81- 84	180.	-	527.	370.	157.	1.693	140.415	3.75	292.95	7485.
4	84- 87	173.	-	506.	370.	136.	1.472	141.887	3.77	292.97	7524.
4	87- 90	165.	-	483.	370.	113.	1.219	143.106	3.79	292.99	7556.
4	90- 93	160.	-	468.	370.	98.	1.061	144.168	3.80	293.00	7584.
4	93- 96	152.	-	445.	370.	75.	0.808	144.976	3.81	293.01	7606.
5	96- 99	143.	-	418.	370.	48.	0.524	145.500	3.82	293.02	7619.
5	99-102	138.	-	404.	370.	34.	0.366	145.867	3.82	293.02	7629.
5	102-105	131.	-	383.	370.	13.	0.144	146.012	3.83	293.03	7633.
5	105-108	127.	-	372.	370.	2.	0.018	146.030	3.83	293.03	7633.
5	108-111	119.	-	348.	370.	-22.	-0.235	145.796	3.82	293.02	7627.
5	111-114	112.	-	328.	370.	-42.	-0.456	145.340	3.82	293.02	7615.
5	114-117	108.	-	316.	370.	-54.	-0.582	144.758	3.81	293.01	7600.
5	117-120	106.	-	310.	370.	-60.	-0.646	144.113	3.80	293.00	7583.
6	120-123	100.	-	293.	370.	-77.	-0.835	143.279	3.79	292.99	7561.
6	123-126	97.	-	284.	370.	-86.	-0.930	142.349	3.78	292.98	7536.
6	126-129	90.	-	263.	370.	-107.	-1.151	141.198	3.76	292.96	7506.
6	129-132	88.	-	258.	370.	-112.	-1.214	139.984	3.75	292.95	7473.
6	132-135	86.	-	252.	370.	-118.	-1.278	138.707	3.73	292.93	7439.
6	135-138	84.	-	246.	370.	-124.	-1.341	137.367	3.71	292.91	7403.
6	138-141.	78.	-	228.	370.	-142.	-1.530	135.837	3.69	292.89	7362.
6	141-144	75.	-	219.	370.	-151.	-1.625	134.212	3.67	292.87	7318.
7	144-147	73.	-	214.	370.	-156.	-1.688	132.524	3.65	292.85	7271.
7	147-150	67.	-	196.	370.	-174.	-1.878	130.646	3.62	292.82	7220.
7	150-153	65.	-	190.	370.	-180.	-1.941	128.705	3.59	292.79	7166.
7	153-156	63.	-	184.	370.	-186.	-2.005	126.701	3.56	292.76	7110.
7	156-159	62.	-	181.	370.	-189.	-2.036	124.666	3.54	292.74	7052.
7	159-162	56.	-	164.	370.	-206.	-2.226	122.440	3.50	292.70	6989.
7	162-165	50.	-	146.	370.	-224.	-2.415	120.026	3.47	292.67	6919.
7	165-168	47.	-	138.	370.	-232.	-2.510	117.516	3.43	292.63	6847.
8	168-171	46.	-	135.	370.	-235.	-2.542	114.975	3.40	292.60	6772.
8	171-174	45.	-	132.	370.	-238.	-2.573	112.402	3.36	292.56	6696.
8	174-177	44.	-	129.	370.	-241.	-2.605	109.797	3.32	292.52	6618.
8	177-180	38.	-	111.	370.	-259.	-2.795	107.003	3.28	292.48	6533.
8	180-183	36.	-	105.	370.	-265.	-2.858	104.146	3.23	292.43	6445.
8	183-186	34.	-	99.	370.	-271.	-2.921	101.225	3.19	292.39	6354.
8	186-189	34.	-	99.	370.	-271.	-2.921	98.305	3.14	292.34	6261.
8	189-192	33.	-	97.	370.	-273.	-2.953	95.353	3.09	292.29	6166.
9	192-195	32.	-	94.	370.	-276.	-2.984	92.369	3.04	292.24	6069.
9	195-198	31.	-	91.	370.	-279.	-3.016	89.354	2.99	292.19	5969.
9	198-201	26.	-	76.	370.	-294.	-3.174	86.180	2.94	292.14	5862.
9	201-204	25.	-	73.	370.	-297.	-3.205	82.975	2.89	292.09	5752.
9	204-207	24.	-	70.	370.	-300.	-3.237	79.739	2.83	292.03	5638.
9	207-210	23.	-	67.	370.	-303.	-3.269	76.471	2.77	291.97	5521.
9	210-213	23.	-	67.	370.	-303.	-3.269	73.202	2.71	291.91	5402.
9	213-216	22.	-	64.	370.	-306.	-3.300	69.903	2.65	291.85	5278.
10	216-219	22.	-	64.	370.	-306.	-3.300	66.603	2.59	291.79	5152.
10	219-222	21.	-	61.	370.	-309.	-3.332	63.272	2.52	291.72	5021.
10	222-225	21.	-	61.	370.	-309.	-3.332	59.940	2.45	291.65	4887.
10	225-228	21.	-	61.	370.	-309.	-3.332	56.609	2.38	291.58	4749.
10	228-231	21.	-	61.	370.	-309.	-3.332	53.278	2.31	291.51	4607.
10	231-234	20.	-	59.	370.	-311.	-3.363	49.915	2.24	291.44	4459.
10	234-237	20.	-	59.	370.	-311.	-3.363	46.552	2.16	291.36	4306.
10	237-240	20.	-	59.	370.	-311.	-3.363	43.189	2.08	291.28	4147.
11	240-243	20.	-	59.	370.	-311.	-3.363	39.826	2.00	291.20	3982.
11	243-246	20.	-	59.	370.	-311.	-3.363	36.463	1.91	291.11	3810.
11	246-249	20.	-	59.	370.	-311.	-3.363	33.100	1.82	291.02	3629.
11	249-252	20.	-	59.	370.	-311.	-3.363	29.737	1.73	290.93	3439.
11	252-255	20.	-	59.	370.	-311.	-3.363	26.374	1.63	290.83	3239.
11	255-258	20.	-	59.	370.	-311.	-3.363	23.011	1.52	290.72	3026.
11	258-261	20.	-	59.	370.	-311.	-3.363	19.648	1.41	290.61	2794.
11	261-264	20.	-	59.	370.	-311.	-3.363	16.285	1.28	290.48	2535.
12	264-267	20.	-	59.	370.	-311.	-3.363	12.922	1.14	290.34	2264.
12	267-270	20.	-	59.	370.	-311.	-3.363	9.559	0.98	290.18	1944.
12	270-273	20.	-	59.	370.	-311.	-3.363	6.196	0.79	289.99	1565.
12	273-276	20.	-	59.	370.	-311.	-3.363	2.833	0.54	289.74	1058.
12	276-279	20.	-	59.	320.	-263.	-2.827	0.006	0.03	289.23	43.
12	279-282	20.	-	59.	59.	-0.	-0.001	0.006	0.03	289.23	43.
12	282-285	20.	-	59.	59.	-0.	-0.000	0.006	0.03	289.23	43.
12	285-288	20.	-	59.	59.	-0.	-0.000	0.006	0.03	289.23	43.

Table E 3-5(2) Flood Control Simulation for After Project on 1 to 50 Years

** PROJECT STATUS ---- AFTER PROJECT
** RETURN PERIOD ----- 1 TO 50 YRS

** RUN DATE/TIME --- SEP, 8,1981/AM 9.30

TIME DAY	TIME HRS	INFLOW AT DAM SITE (CUM/S)	SPILLAGE FROM DAM (CUM/S)	INFLOW TO INT.POINT (CUM/S)	OUTFLOW INT.POINT (CUM/S)	BALANCE INT.POINT (CUM/S)	BALANCE INT.POINT (MCM)	INUNDATED VOLUME (MCM)	INUNDATED DEPTH (M)	INUNDATED STAGE (EL.M)	INUNDATED AREA (HA)
1	0- 3	20.	0.	39.	39.	0.	0.000	0.001	0.01	289.21	14.
1	3- 6	22.	0.	42.	42.	0.	0.005	0.006	0.03	289.23	43.
1	6- 9	29.	0.	56.	56.	-0.	-0.000	0.006	0.03	289.23	43.
1	9- 12	42.	0.	81.	81.	-0.	-0.000	0.006	0.03	289.23	43.
1	12- 15	60.	0.	116.	116.	-0.	-0.000	0.006	0.03	289.23	43.
1	15- 18	124.	0.	239.	239.	-0.	-0.000	0.006	0.03	289.23	43.
1	18- 21	341.	0.	657.	370.	287.	3.098	3.105	0.56	289.76	1105.
1	21- 24	698.	0.	1344.	370.	974.	10.525	13.631	1.17	290.37	2326.
2	24- 27	861.	0.	1658.	370.	1288.	13.916	27.547	1.66	290.86	3310.
2	27- 30	538.	0.	1036.	370.	666.	7.196	34.744	1.87	291.07	3718.
2	30- 33	409.	0.	788.	370.	418.	4.513	39.257	1.99	291.19	3953.
2	33- 36	331.	0.	638.	370.	268.	2.890	42.148	2.06	291.26	4097.
2	36- 39	319.	0.	614.	370.	244.	2.641	44.789	2.12	291.32	4223.
2	39- 42	309.	2.	597.	370.	227.	2.454	47.243	2.18	291.38	4338.
2	42- 45	303.	4.	588.	370.	218.	2.351	49.595	2.23	291.43	4445.
2	45- 48	285.	7.	556.	370.	186.	2.009	51.604	2.28	291.48	4534.
3	48- 51	268.	14.	530.	370.	160.	1.731	53.335	2.31	291.51	4609.
3	51- 54	260.	28.	529.	370.	159.	1.716	55.052	2.35	291.55	4683.
3	54- 57	255.	42.	533.	370.	163.	1.763	56.815	2.39	291.59	4758.
3	57- 60	251.	70.	553.	370.	183.	1.982	58.797	2.43	291.63	4840.
3	60- 63	246.	105.	579.	370.	209.	2.256	61.054	2.48	291.68	4932.
3	63- 66	241.	126.	590.	370.	220.	2.379	63.433	2.52	291.72	5028.
3	66- 69	237.	140.	597.	370.	227.	2.447	65.880	2.57	291.77	5124.
3	69- 72	237.	147.	604.	370.	234.	2.522	68.403	2.62	291.82	5221.
4	72- 75	232.	148.	595.	370.	225.	2.429	70.833	2.67	291.87	5313.
4	75- 78	221.	147.	573.	370.	203.	2.190	73.023	2.71	291.91	5395.
4	78- 81	202.	145.	534.	370.	164.	1.773	74.796	2.74	291.94	5460.
4	81- 84	180.	143.	490.	370.	120.	1.293	76.090	2.76	291.96	5507.
4	84- 87	173.	141.	474.	370.	104.	1.126	77.216	2.78	291.98	5548.
4	87- 90	165.	139.	457.	370.	87.	0.938	78.155	2.80	292.00	5582.
4	90- 93	160.	137.	445.	370.	75.	0.813	78.968	2.82	292.01	5611.
4	93- 96	152.	134.	427.	370.	57.	0.614	79.582	2.83	292.03	5633.
5	96- 99	143.	132.	407.	370.	37.	0.405	79.988	2.83	292.03	5647.
5	99-102	138.	130.	396.	370.	26.	0.279	80.268	2.84	292.04	5657.
5	102-105	131.	128.	380.	370.	10.	0.112	80.380	2.84	292.04	5661.
5	105-108	127.	126.	371.	370.	1.	0.007	80.388	2.84	292.04	5661.
5	108-111	119.	124.	353.	370.	-17.	-0.181	80.208	2.84	292.04	5655.
5	111-114	112.	122.	338.	370.	-32.	-0.348	79.860	2.83	292.03	5642.
5	114-117	108.	120.	328.	370.	-42.	-0.453	79.408	2.82	292.02	5626.
5	117-120	106.	116.	320.	370.	-50.	-0.538	78.871	2.81	292.01	5607.
6	120-123	100.	112.	305.	370.	-65.	-0.706	78.165	2.80	292.00	5582.
6	123-126	97.	108.	295.	370.	-75.	-0.811	77.355	2.79	291.99	5553.
6	126-129	90.	98.	271.	370.	-99.	-1.065	76.290	2.77	291.97	5515.
6	129-132	88.	95.	265.	370.	-105.	-1.139	75.152	2.75	291.95	5473.
6	132-135	86.	92.	258.	370.	-112.	-1.213	73.940	2.72	291.92	5429.
6	135-138	84.	90.	252.	370.	-118.	-1.276	72.664	2.70	291.90	5382.
6	138-141	78.	81.	231.	370.	-139.	-1.498	71.166	2.67	291.87	5326.
6	141-144	75.	77.	221.	370.	-149.	-1.604	69.563	2.64	291.84	5265.
7	144-147	73.	74.	215.	370.	-155.	-1.678	67.886	2.61	291.81	5202.
7	147-150	67.	66.	195.	370.	-175.	-1.889	65.998	2.57	291.77	5129.
7	150-153	65.	63.	188.	370.	-182.	-1.963	64.035	2.54	291.74	5052.
7	153-156	63.	60.	181.	370.	-189.	-2.037	61.999	2.49	291.69	4970.
7	156-159	62.	59.	178.	370.	-192.	-2.069	59.931	2.45	291.65	4887.
7	159-162	56.	50.	158.	370.	-212.	-2.291	57.641	2.41	291.61	4792.
7	162-165	50.	42.	138.	370.	-232.	-2.502	55.139	2.35	291.55	4687.
7	165-168	47.	38.	129.	370.	-241.	-2.607	52.532	2.30	291.50	4575.
8	168-171	46.	36.	125.	370.	-245.	-2.650	49.883	2.24	291.44	4457.
8	171-174	45.	35.	122.	370.	-248.	-2.681	47.202	2.18	291.38	4336.
8	174-177	44.	34.	119.	370.	-251.	-2.713	44.490	2.11	291.31	4209.
8	177-180	38.	25.	98.	370.	-272.	-2.935	41.555	2.04	291.24	4068.
8	180-183	36.	22.	91.	370.	-279.	-3.009	38.547	1.97	291.17	3917.
8	183-186	34.	20.	85.	370.	-285.	-3.072	35.475	1.89	291.09	3757.
8	186-189	34.	20.	85.	370.	-285.	-3.072	32.403	1.81	291.00	3591.
8	189-192	33.	18.	82.	370.	-288.	-3.115	29.289	1.72	290.92	3413.
9	192-195	32.	16.	78.	370.	-292.	-3.157	26.133	1.62	290.82	3224.
9	195-198	31.	12.	72.	370.	-298.	-3.221	22.912	1.52	290.72	3018.
9	198-201	26.	9.	59.	370.	-311.	-3.357	19.555	1.40	290.60	2787.
9	201-204	25.	7.	55.	370.	-315.	-3.400	16.156	1.28	290.48	2533.
9	204-207	24.	6.	52.	370.	-318.	-3.431	12.725	1.13	290.33	2247.
9	207-210	23.	4.	48.	370.	-322.	-3.474	9.252	0.97	290.17	1914.
9	210-213	23.	4.	48.	370.	-322.	-3.474	5.778	0.77	289.97	1511.
9	213-216	22.	3.	45.	370.	-325.	-3.505	2.273	0.48	289.68	944.
10	216-219	22.	3.	45.	255.	-210.	-2.267	0.006	0.03	289.23	43.
10	219-222	21.	2.	42.	43.	-0.	-0.001	0.006	0.03	289.23	43.
10	222-225	21.	2.	42.	43.	-0.	-0.000	0.006	0.03	289.23	43.
10	225-228	21.	1.	41.	42.	-0.	-0.000	0.006	0.03	289.23	43.
10	228-231	21.	1.	41.	42.	-0.	-0.000	0.006	0.03	289.23	43.
10	231-234	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
10	234-237	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
10	237-240	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
11	240-243	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
11	243-246	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
11	246-249	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
11	249-252	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
11	252-255	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
11	255-258	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
11	258-261	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
11	261-264	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
12	264-267	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
12	267-270	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
12	270-273	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
12	273-276	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
12	276-279	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
12	279-282	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
12	282-285	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
12	285-288	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.

Table E 3-6(1) Flood Control Simulation for Before Project on 1 to 100 Years

** PROJECT STATUS ---- BEFORE PROJECT
** RETURN PERIOD ----- 1 TO 100 YRS
** RUN DATE/TIME --- SEP, 8,1981/AM 9,30

TIME		INFLOW AT DAM SITE	SPILLAGE FROM DAM	INFLOW TO INT.POINT	OUTFLOW INT.POINT	BALANCE INT.POINT	BALANCE INT.POINT	INUNDATED VOLUME	INUNDATED DEPTH	INUNDATED STAGE	INUNDATED AREA
DAY	HRS	(CUM/S)	(CUM/S)	(CUM/S)	(CUM/S)	(CUM/S)	(MCM)	(MCM)	(M)	(EL.M)	(HA)
1	0- 3	20.	-	59.	59.	0.	0.000	0.001	0.01	289.21	14.
1	3- 6	22.	-	64.	64.	0.	0.005	0.006	0.03	289.23	43.
1	6- 9	31.	-	91.	91.	-0.	-0.000	0.006	0.03	289.23	41.
1	9- 12	47.	-	138.	138.	-0.	-0.000	0.006	0.03	289.23	43.
1	12- 15	70.	-	205.	205.	-0.	-0.000	0.006	0.03	289.23	43.
1	15- 18	151.	-	442.	400.	42.	0.453	0.459	0.22	289.42	419.
1	18- 21	420.	-	1229.	400.	829.	8.954	9.414	0.98	290.18	1931.
1	21- 24	866.	-	2534.	400.	2134.	23.049	32.463	1.81	291.01	3594.
2	24- 27	1065.	-	3116.	400.	2716.	29.337	61.801	2.49	291.69	4962.
2	27- 30	655.	-	1917.	400.	1517.	16.380	78.181	2.80	292.00	5583.
2	30- 33	488.	-	1428.	400.	1028.	11.103	89.284	2.99	292.19	5967.
2	33- 36	382.	-	1118.	400.	718.	7.753	97.038	3.12	292.32	6221.
2	36- 39	365.	-	1068.	400.	668.	7.216	104.254	3.23	292.43	6448.
2	39- 42	350.	-	1024.	400.	624.	6.741	110.996	3.34	292.54	6656.
2	42- 45	340.	-	995.	400.	595.	6.425	117.422	3.43	292.63	6844.
2	45- 48	314.	-	919.	400.	519.	5.604	123.026	3.51	292.71	7006.
3	48- 51	791.	-	2315.	400.	1915.	20.678	143.705	3.80	293.00	7572.
3	51- 54	779.	-	2279.	400.	1879.	20.299	164.004	4.05	293.25	8390.
3	54- 57	271.	-	793.	400.	393.	4.245	168.250	4.11	293.31	8194.
3	57- 60	264.	-	773.	400.	373.	4.024	172.274	4.16	293.36	8292.
3	60- 63	256.	-	749.	400.	349.	3.771	176.045	4.20	293.40	8382.
3	63- 66	249.	-	729.	400.	329.	3.550	179.595	4.24	293.44	8466.
3	66- 69	243.	-	711.	400.	311.	3.360	182.956	4.28	293.48	8545.
3	69- 72	241.	-	705.	400.	305.	3.297	186.253	4.32	293.52	8622.
4	72- 75	234.	-	685.	400.	285.	3.076	189.329	4.36	293.56	8693.
4	75- 78	223.	-	653.	400.	253.	2.728	192.057	4.39	293.59	8755.
4	78- 81	206.	-	603.	400.	203.	2.191	194.248	4.41	293.61	8805.
4	81- 84	188.	-	550.	400.	150.	1.622	195.871	4.43	293.63	8842.
4	84- 87	182.	-	533.	400.	133.	1.432	197.303	4.45	293.65	8874.
4	87- 90	173.	-	506.	400.	106.	1.148	198.452	4.46	293.66	8909.
4	90- 93	169.	-	495.	400.	95.	1.021	199.473	4.47	293.67	8923.
4	93- 96	159.	-	465.	400.	65.	0.705	200.179	4.48	293.68	8939.
5	96- 99	150.	-	439.	400.	39.	0.421	200.601	4.48	293.68	8948.
5	99-102	145.	-	424.	400.	24.	0.263	200.864	4.49	293.69	8954.
5	102-105	137.	-	401.	400.	1.	0.010	200.875	4.49	293.69	8956.
5	105-108	134.	-	392.	400.	-8.	-0.085	200.790	4.49	293.69	8952.
5	108-111	125.	-	366.	400.	-34.	-0.369	200.422	4.48	293.68	8944.
5	111-114	117.	-	342.	400.	-58.	-0.622	199.800	4.47	293.67	8930.
5	114-117	113.	-	331.	400.	-69.	-0.748	199.052	4.47	293.67	8914.
5	117-120	110.	-	322.	400.	-78.	-0.843	198.210	4.46	293.66	8895.
6	120-123	104.	-	304.	400.	-96.	-1.033	197.177	4.45	293.65	8871.
6	123-126	101.	-	296.	400.	-104.	-1.128	196.050	4.43	293.63	8846.
6	126-129	94.	-	275.	400.	-125.	-1.349	194.702	4.42	293.62	8816.
6	129-132	91.	-	266.	400.	-134.	-1.444	193.259	4.40	293.60	8783.
6	132-135	89.	-	260.	400.	-140.	-1.507	191.752	4.38	293.58	8749.
6	135-138	88.	-	258.	400.	-142.	-1.538	190.214	4.37	293.57	8713.
6	138-141	81.	-	237.	400.	-163.	-1.760	188.455	4.35	293.55	8673.
6	141-144	78.	-	228.	400.	-172.	-1.854	186.601	4.32	293.52	8630.
7	144-147	76.	-	222.	400.	-178.	-1.918	184.684	4.30	293.50	8585.
7	147-150	69.	-	202.	400.	-198.	-2.139	182.546	4.28	293.48	8536.
7	150-153	67.	-	196.	400.	-204.	-2.202	180.344	4.25	293.45	8484.
7	153-156	65.	-	190.	400.	-210.	-2.265	178.079	4.22	293.42	8430.
7	156-159	64.	-	187.	400.	-213.	-2.297	175.783	4.20	293.40	8376.
7	159-162	58.	-	170.	400.	-230.	-2.487	173.297	4.17	293.37	8316.
7	162-165	50.	-	146.	400.	-254.	-2.739	170.558	4.13	293.33	8250.
7	165-168	47.	-	138.	400.	-262.	-2.834	167.724	4.10	293.30	8181.
8	168-171	46.	-	135.	400.	-265.	-2.866	164.859	4.07	293.27	8111.
8	171-174	45.	-	132.	400.	-268.	-2.897	161.962	4.03	293.23	8039.
8	174-177	44.	-	129.	400.	-271.	-2.929	159.033	3.99	293.19	7966.
8	177-180	37.	-	108.	400.	-292.	-3.150	155.884	3.95	293.15	7887.
8	180-183	35.	-	102.	400.	-298.	-3.213	152.671	3.91	293.11	7805.
8	183-186	33.	-	97.	400.	-303.	-3.277	149.395	3.87	293.07	7721.
8	186-189	33.	-	97.	400.	-303.	-3.277	146.118	3.83	293.03	7636.
8	189-192	32.	-	94.	400.	-306.	-3.308	142.811	3.78	292.98	7549.
9	192-195	32.	-	94.	400.	-306.	-3.308	139.503	3.74	292.94	7461.
9	195-198	31.	-	91.	400.	-309.	-3.340	136.164	3.70	292.89	7371.
9	198-201	25.	-	73.	400.	-327.	-3.529	132.635	3.65	292.85	7274.
9	201-204	23.	-	67.	400.	-333.	-3.593	129.043	3.60	292.80	7175.
9	204-207	22.	-	64.	400.	-336.	-3.624	125.419	3.55	292.75	7073.
9	207-210	22.	-	64.	400.	-336.	-3.624	121.795	3.49	292.69	6970.
9	210-213	22.	-	64.	400.	-336.	-3.624	118.171	3.44	292.64	6866.
9	213-216	21.	-	61.	400.	-339.	-3.656	114.516	3.39	292.59	6759.
10	216-219	21.	-	61.	400.	-339.	-3.656	110.861	3.33	292.53	6650.
10	219-222	21.	-	61.	400.	-339.	-3.656	107.205	3.28	292.48	6539.
10	222-225	21.	-	61.	400.	-339.	-3.656	103.550	3.22	292.42	6426.
10	225-228	20.	-	59.	400.	-341.	-3.687	99.863	3.17	292.36	6311.
10	228-231	20.	-	59.	400.	-341.	-3.687	96.176	3.11	292.31	6193.
10	231-234	20.	-	59.	400.	-341.	-3.687	92.489	3.05	292.25	6073.
10	234-237	20.	-	59.	400.	-341.	-3.687	88.802	2.98	292.18	5950.
10	237-240	20.	-	59.	400.	-341.	-3.687	85.115	2.92	292.12	5825.
11	240-243	20.	-	59.	400.	-341.	-3.687	81.428	2.86	292.06	5698.
11	243-246	20.	-	59.	400.	-341.	-3.687	77.741	2.79	291.99	5567.
11	246-249	20.	-	59.	400.	-341.	-3.687	74.054	2.73	291.93	5433.
11	249-252	20.	-	59.	400.	-341.	-3.687	70.367	2.66	291.86	5296.
11	252-255	20.	-	59.	400.	-341.	-3.687	66.680	2.59	291.79	5155.
11	255-258	20.	-	59.	400.	-341.	-3.687	62.993	2.51	291.71	5010.
11	258-261	20.	-	59.	400.	-341.	-3.687	59.307	2.44	291.64	4861.
11	261-264	20.	-	59.	400.	-341.	-3.687	55.620	2.36	291.56	4707.
12	264-267	20.	-	59.	400.	-341.	-3.687	51.933	2.28	291.48	4548.
12	267-270	20.	-	59.	400.	-341.	-3.687	48.246	2.20	291.40	4384.
12	270-273	20.	-	59.	400.	-341.	-3.687	44.559	2.12	291.32	4212.
12	273-276	20.	-	59.	400.	-341.	-3.687	40.872	2.03	291.23	4034.
12	276-279	20.	-	59.	400.	-341.	-3.687	37.185	1.93	291.13	3847.
12	279-282	20.	-	59.	400.	-341.	-3.687	33.498	1.84	291.04	3651.
12	282-285	20.	-	59.	400.	-341.	-3.687	29.811	1.73	290.93	3444.
12	285-288	20.	-	59.	400.	-341.	-3.687	26.124	1.62	290.82	3223.

Table E 3-6(2) Flood Control Simulation for After Project on 1 to 100 Years

PROJECT STATUS —— AFTER PROJECT
RETURN PERIOD ——— 1 TO 100 YRS

** RUN DATE/TIME —— SEP. 8,1981/AM 9.30

TIME HRS	INFLOW AT DAM SITE (CUM/S)	SPILLAGE FROM DAM (CUM/S)	INFLOW TO INT.POINT (CUM/S)	OUTFLOW INT.POINT (CUM/S)	BALANCE INT.POINT (CUM/S)	BALANCE INT.POINT (MCM)	INUNDATED VOLUME (MCM)	INUNDATED DEPTH (M)	INUNDATED STAGE (EL.M)	INUNDATED AREA (HA)
	20.	0.	39.	39.	0.	0.000	0.001	0.01	289.21	14.
0- 3	22.	0.	42.	42.	0.	0.005	0.006	0.03	289.23	43.
3- 6	31.	0.	60.	60.	-0.	-0.000	0.006	0.03	289.23	43.
6- 9	47.	0.	91.	91.	-0.	-0.000	0.006	0.03	289.23	43.
9- 12	70.	0.	135.	135.	-0.	-0.000	0.006	0.03	289.23	43.
12- 15	151.	0.	291.	291.	-0.	-0.000	0.006	0.03	289.23	43.
15- 18	420.	0.	809.	400.	409.	4.418	4.425	0.67	289.87	1321.
18- 21	866.	0.	1668.	400.	1268.	13.696	18.121	1.35	290.55	2683.
21- 24	1065.	0.	2051.	400.	1651.	17.835	35.957	1.90	291.10	3783.
24- 27	655.	0.	1262.	400.	862.	9.306	45.264	2.13	291.33	4246.
27- 30	488.	0.	940.	400.	540.	5.832	51.096	2.27	291.47	4511.
30- 33	382.	0.	736.	400.	336.	3.627	54.724	2.34	291.54	4669.
33- 36	365.	0.	703.	400.	303.	3.274	57.998	2.41	291.61	4807.
36- 39	350.	2.	676.	400.	276.	2.983	60.982	2.47	291.67	4929.
39- 42	340.	5.	660.	400.	260.	2.807	63.789	2.53	291.73	5042.
42- 45	314.	10.	615.	400.	215.	2.321	66.111	2.58	291.78	5133.
45- 48	791.	20.	1544.	400.	1144.	12.352	78.462	2.81	292.01	5593.
48- 51	779.	40.	1540.	400.	1140.	12.318	90.781	3.02	292.22	6016.
51- 54	271.	60.	582.	400.	182.	1.966	92.747	3.05	292.25	6081.
54- 57	264.	100.	609.	400.	209.	2.252	95.000	3.09	292.29	6155.
57- 60	256.	150.	643.	400.	243.	2.626	97.627	3.13	292.33	6240.
60- 63	249.	180.	660.	400.	260.	2.804	100.432	3.17	292.37	6329.
63- 66	243.	200.	668.	400.	268.	2.896	103.328	3.22	292.42	6419.
66- 69	241.	210.	674.	400.	274.	2.962	106.290	3.27	292.47	6511.
69- 72	234.	212.	663.	400.	263.	2.838	109.129	3.31	292.51	6597.
72- 75	223.	210.	640.	400.	240.	2.588	111.717	3.35	292.55	6675.
75- 78	206.	207.	604.	400.	204.	2.201	113.919	3.38	292.58	6741.
78- 81	188.	204.	566.	400.	166.	1.795	115.714	3.41	292.61	6794.
81- 84	182.	201.	552.	400.	152.	1.637	117.352	3.43	292.63	6842.
84- 87	173.	198.	531.	400.	131.	1.418	118.770	3.45	292.65	6883.
87- 90	169.	195.	521.	400.	121.	1.302	120.072	3.47	292.67	6921.
90- 93	159.	192.	498.	400.	98.	1.062	121.135	3.49	292.69	6951.
93- 96	150.	189.	478.	400.	78.	0.842	121.977	3.50	292.70	6976.
96- 99	145.	186.	465.	400.	65.	0.706	122.684	3.51	292.71	6996.
99-102	137.	183.	447.	400.	47.	0.507	123.191	3.51	292.71	7010.
102-105	134.	180.	438.	400.	38.	0.412	123.603	3.52	292.72	7022.
105-108	125.	177.	418.	400.	18.	0.192	123.796	3.52	292.72	7027.
108-111	117.	174.	399.	400.	-1.	-0.006	123.790	3.52	292.72	7027.
111-114	113.	171.	389.	400.	-11.	-0.122	123.669	3.52	292.72	7024.
114-117	110.	166.	378.	400.	-22.	-0.238	123.431	3.52	292.72	7017.
117-120	104.	160.	360.	400.	-40.	-0.428	123.004	3.51	292.71	7005.
120-123	101.	154.	349.	400.	-51.	-0.555	122.449	3.50	292.70	6989.
123-126	96.	140.	321.	400.	-79.	-0.852	121.597	3.49	292.69	6965.
126-129	91.	136.	311.	400.	-89.	-0.958	120.640	3.48	292.68	6937.
129-132	89.	132.	303.	400.	-97.	-1.042	119.598	3.46	292.66	6907.
132-135	88.	128.	298.	400.	-102.	-1.106	118.492	3.45	292.65	6875.
135-138	81.	116.	272.	400.	-128.	-1.382	117.111	3.43	292.63	6835.
138-141	78.	110.	260.	400.	-140.	-1.509	115.603	3.41	292.60	6791.
141-144	76.	106.	252.	400.	-148.	-1.594	114.009	3.38	292.58	6744.
144-147	69.	94.	227.	400.	-173.	-1.869	112.141	3.35	292.55	6688.
147-150	67.	90.	219.	400.	-181.	-1.954	110.188	3.32	292.52	6629.
150-153	65.	86.	211.	400.	-189.	-2.039	108.150	3.29	292.49	6568.
153-156	64.	84.	207.	400.	-193.	-2.081	106.069	3.26	292.46	6504.
156-159	58.	72.	184.	400.	-216.	-2.335	103.734	3.23	292.43	6432.
159-162	50.	60.	156.	400.	-244.	-2.631	101.103	3.18	292.38	6350.
162-165	47.	54.	145.	400.	-255.	-2.759	98.345	3.14	292.34	6263.
165-168	46.	52.	141.	400.	-259.	-2.801	95.545	3.10	292.30	6173.
168-171	45.	50.	137.	400.	-263.	-2.843	92.702	3.05	292.25	6080.
171-174	44.	48.	133.	400.	-267.	-2.886	89.817	3.00	292.20	5984.
174-177	37.	36.	107.	400.	-293.	-3.161	86.656	2.95	292.15	5878.
177-180	35.	32.	99.	400.	-301.	-3.246	83.411	2.89	292.09	5767.
180-183	33.	28.	92.	400.	-308.	-3.331	80.081	2.83	292.03	5650.
183-186	33.	28.	92.	400.	-308.	-3.331	76.751	2.78	291.98	5531.
186-189	32.	26.	88.	400.	-312.	-3.373	73.378	2.71	291.91	5408.
189-192	32.	24.	86.	400.	-314.	-3.395	69.984	2.65	291.85	5281.
192-195	31.	22.	82.	400.	-318.	-3.437	66.547	2.58	291.78	5150.
195-198	25.	12.	60.	400.	-340.	-3.670	62.878	2.51	291.71	5006.
198-201	23.	10.	54.	400.	-346.	-3.733	59.146	2.44	291.64	4854.
201-204	22.	8.	50.	400.	-350.	-3.775	55.371	2.36	291.56	4697.
204-207	22.	6.	48.	400.	-352.	-3.797	51.574	2.28	291.48	4533.
207-210	22.	6.	48.	400.	-352.	-3.797	47.777	2.19	291.39	4362.
210-213	21.	4.	44.	400.	-356.	-3.839	43.939	2.10	291.30	4183.
213-216	21.	4.	44.	400.	-356.	-3.839	40.100	2.01	291.21	3996.
216-219	21.	2.	42.	400.	-358.	-3.861	36.239	1.91	291.11	3798.
219-222	21.	2.	42.	400.	-358.	-3.861	32.378	1.80	291.00	3589.
222-225	20.	2.	41.	400.	-359.	-3.882	28.497	1.69	290.89	3367.
225-228	20.	2.	41.	400.	-359.	-3.882	24.616	1.57	290.77	3128.
228-231	20.	0.	39.	400.	-361.	-3.903	20.713	1.44	290.64	2869.
231-234	20.	0.	39.	400.	-361.	-3.903	16.810	1.30	290.50	2584.
234-237	20.	0.	39.	400.	-361.	-3.903	12.907	1.14	290.34	2263.
237-240	20.	0.	39.	400.	-361.	-3.903	9.004	0.95	290.15	1888.
240-243	20.	0.	39.	400.	-361.	-3.903	5.101	0.72	289.92	1419.
243-246	20.	0.	39.	400.	-361.	-3.903	1.198	0.35	289.55	683.
246-249	20.	0.	39.	149.	-110.	-1.192	0.006	0.03	289.23	43.
249-252	20.	0.	39.	39.	-0.	-0.001	0.006	0.03	289.23	43.
252-255	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
255-258	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
258-261	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
261-264	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
264-267	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
267-270	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
270-273	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
273-276	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
276-279	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
279-282	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
282-285	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.
285-288	20.	0.	39.	39.	-0.	-0.000	0.006	0.03	289.23	43.

APPENDIX F. AGRICULTURE AND SUPPORTING SERVICES

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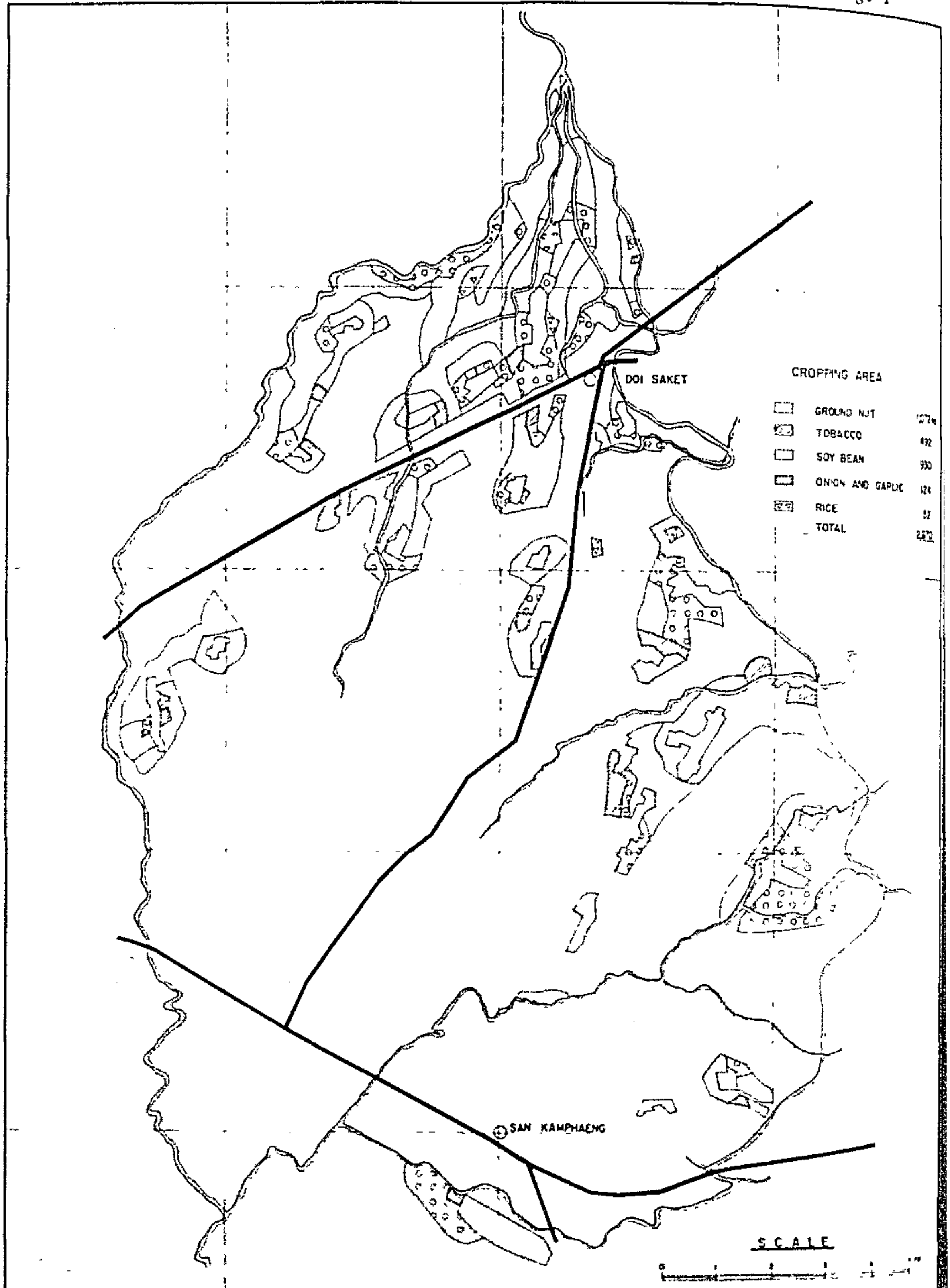

FIGURE F 1-1
DISTRIBUTION OF DRY SEASON CROP CULTIVATION IN THE EXISTING IRRIGATED AREA (1978)

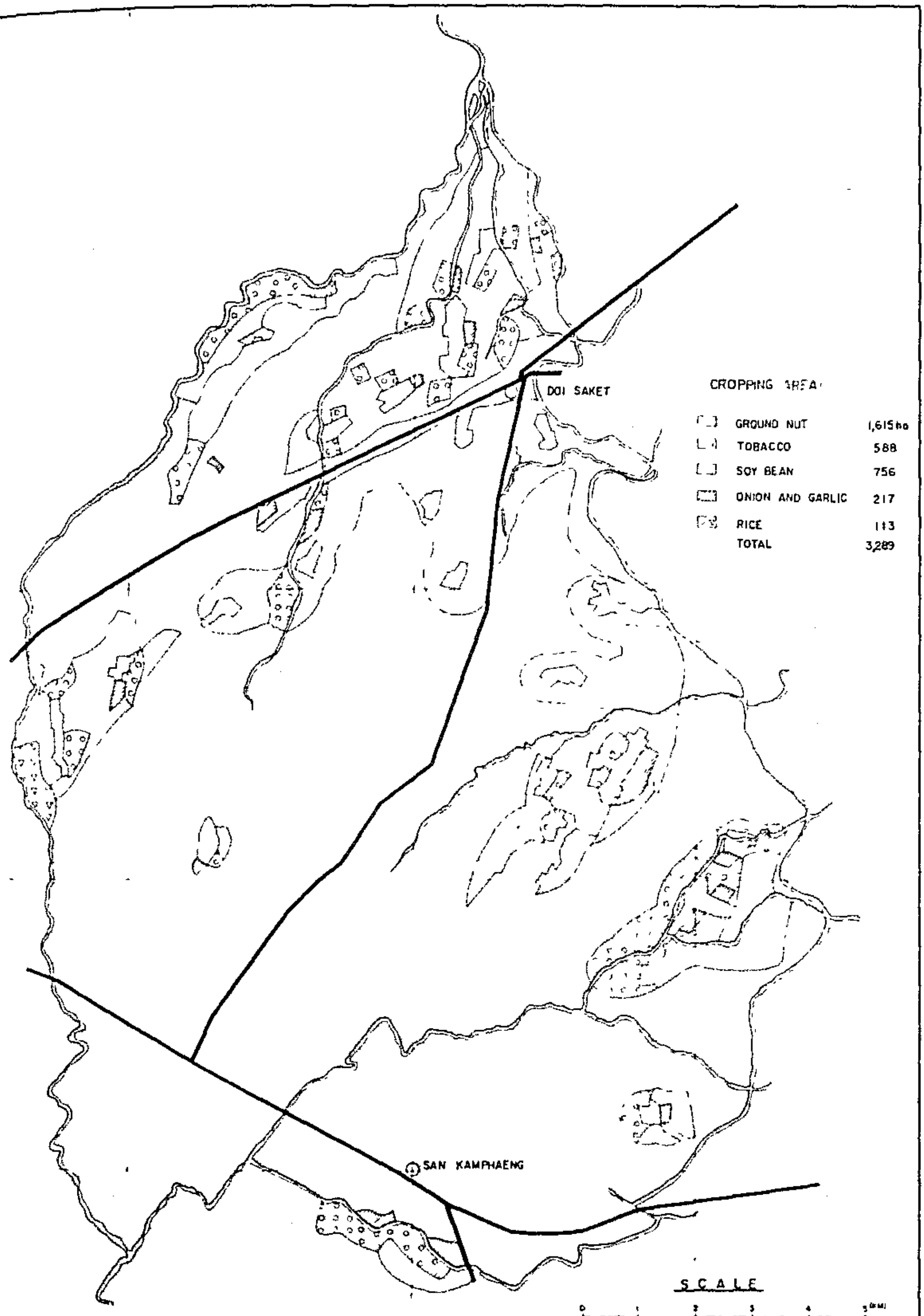

FIGURE F 1-2
DISTRIBUTION OF DRY SEASON CROP CULTIVATION IN THE EXISTING IRRIGATED AREA (1979)

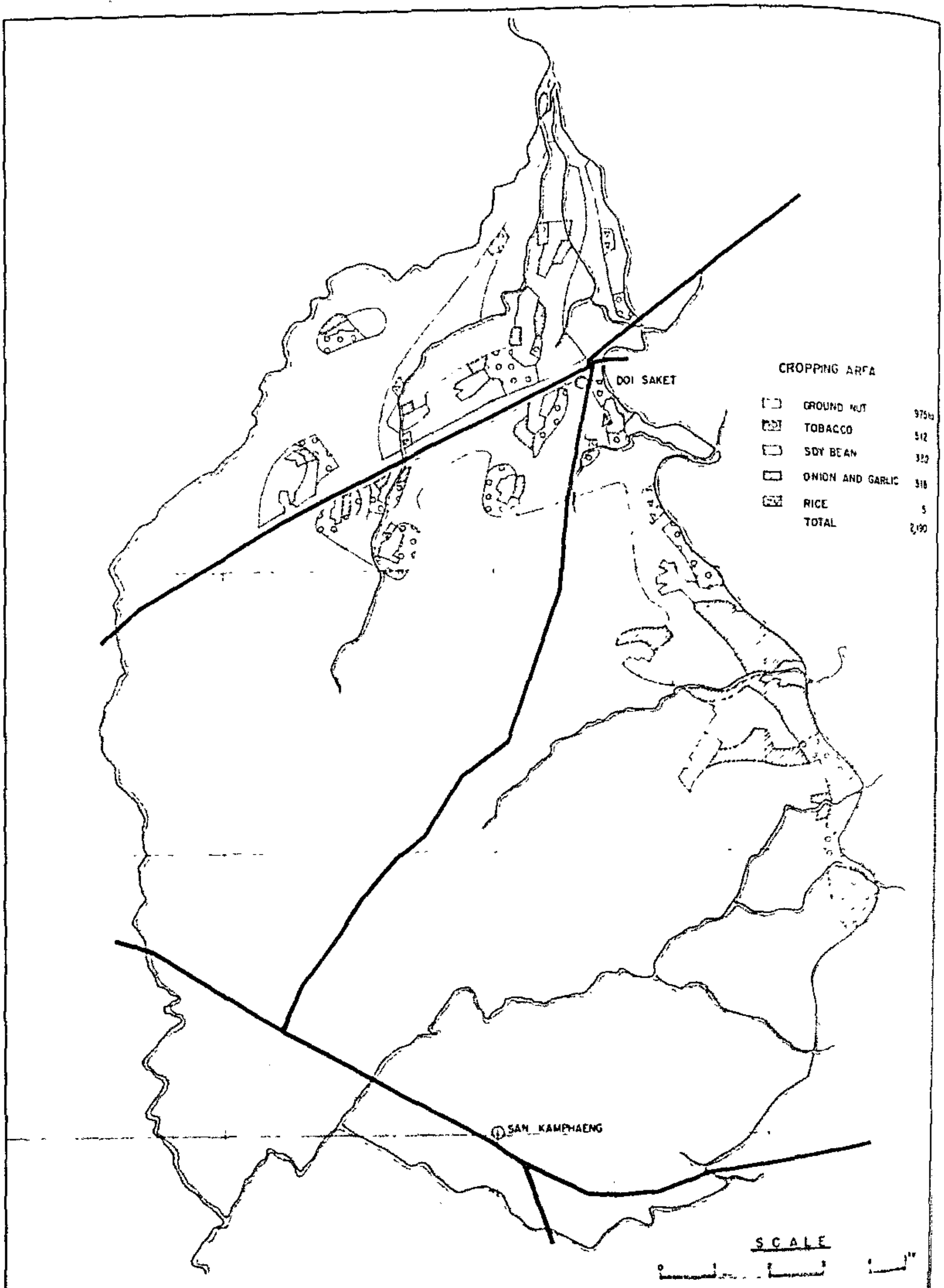

FIGURE F 1-3
DISTRIBUTION OF DRY SEASON CROP CULTIVATION IN THE EXISTING IRRIGATED AREA (1980)

Table F 2-1 Cultivtion Method of Rice (Wet and Dry Season) and Other Crops (Dry Season)

Crops	Rice (Wet Season)	Rice (Dry Season)	Soybeans	Groundnuts	Sweet Corn	Tobacco (Virginia)	Garlic
Varieties	Niaw Sampatong (gl.) RD-4 (gl.)	RD-4 (gl.) Grow pai 15 (non-gl.) Dawk mali 3 (non-gl.)	SJ-1 SJ-2 SJ-4	Tainan 9, Sukotai 38, Lampang	DMR Super sweet corn Hawaiian	Corker 411, Corker 347 Corker 187	Native
Seeds	Almost self supplied except new varieties.	Same as wet season	Bought 50%, self supplied	Same as soybeans	Same as soybeans		
Nursery	1 rai/field 15 rai Amount of seeds to be sown 10-12 kg/rai seeding Seeding Jul. – Aug.	Amount of seeds/rai 10-15 kg seeding Jan.	–	–	–		
Land preparation	Buffalo or small type of machine plowing 2 times, harrowing 1 time	Same as wet season.	–	Plowing and harrowing	Plowing and harrowing	Plowing and harrowing	
Planting or transplanting	25-30 days after sowing 20x20cm or 20x25cm	Feb. 20-25 days after sowing	Sowing in row 50cm row or make hole for seed after rice harvest 20-25cm x 25cm end of Dec.-mid of Jan.	Sowing in rows 20x30cm Time same as soybeans	Planting Dec. – Jan. Planting into row 60x80cm	30-50 days after sowing Seedlings are supplied by Tobaccs Monopoly Office	Nov - Dec. after planting cover with straw
Fertilization	Most farmers use no fertilizer and manure. Recommended method is: 16-20-0 15-20 kg/rai (local recommended var.) 20-25 kg/rai (new var.) Applying time- 1st month after planting 50% 2nd flowing stage 50%	16-20-0 over 25 kg/rai	Most of the farmers use no fertilizers. In extension program: 12-24-12 25-30 kg/rai	Same as soybeans	12-24-12 50 kg/rai after germination 50% 20 days after germination 50%	6-15-30, 100-120 gr/rai divided into 2-3 times to apply, 3-5 days after transplanting Manure, no use	13-13-21 or 15-15-15 100 kg/rai after planting
Irrigation	Plot to plot about 10cm depth	Same as wet season	Done when drought	Same as soybeans	Same as soybeans	3 weeks after transplanting not irrigation to let plants tolerance afterwards irrigation is done between 7 - 10 days	Done
Diseases and Pests control	Rice blast. Bacterial leaf blight. Damages are not so serious Crab, rats, when widely damaged systematically controlled by chemicals	Same as wet season	Rat, bean fly, leaf worm Dimethioate, Sevin, Azodrin, Zymigydrin	Same as soybeans	Stem borer Dimetate, Azodrin Downy mildew Ridomil	Wilt (bacteria), leaf curl, streak leaf (virus) nothing can be used. Damping off, Fusarium wilt chemical is nursery insecticide furadan etc.	Purple block, rotten white fly. Fungicide, aldrex
Weeding	Deep water control and pick off by hand	Same as wet season	–	Cultivating	Cultivating		by hand
Harvesting	Early Nov. – Beginning of Dec. by hand	Jun. by hand	End of Apr. – mid. of May	Same as soybeans	Feb. – Mar.	1st time 50 - 80 days after transplanting up to types of tobacco and after the 1st time about 7 days each for 5 times. Pick up by hand the optimum leaf.	By hand Feb. - Mar. 90 - 120 days after planting
Yield	580 kg/rai Niaw Sampatong some times got 1,000 kg/rai by new var.	516 kg/rai	180 - 200 kg/rai	236 kg/rai (with hull)	149 kg/rai (dry)	60 - 200 kg/rai (dry weight)	1,800 kg/rai (fresh)
Processing and Marketing	Mainly for home use. Rice mill in Chiang mai. Waste products: strow for mashroom bed, cow and buffaloes feed, covering garlic and onions.	Same as wet season	Sell all	Sell all	Sell all	Cured about 80 - 120 hours at 32°C - 75°C - 80°C Marketing private curing - fresh leaves Monopoly, Exporter } dry leaves	

Marketing Flow of Agricultural Products

1. Peanuts

a) From Farmers

Farmers ——

Merchants in village	15.6%
Merchants in Tambol	6.3%
Merchants in Amphoe	37.4%
Merchants in other Amphoe	9.4%
Merchants in city	25%
Buyers from other Changwat	-
Others	6.3%

b) From Merchants

Merchants ——

Merchants in Tambol	6.3%
Merchants in Amphoe	12.5%
Merchants in city	62.5%
Buyers from other Changwat	18.7%

Remarks: 1. About 60% of peanut sales from farmers is purchased by merchants in same Amphoe.

2. About 60% of peanut: purchased by merchants goes to merchants in city.

Source: Study of Farm to Whole Sale Marketing in the Chiang Mai Valley, Chiang Mai Univ. 1979.

2. Mungbean

a) From Farmers

Farmers	Merchants in village	68.7%
	Merchants in Tambol	12.5%
	Merchants in Amphoe	-
	Merchants in other Amphoe	
	Merchants in city	9.4%
	Local Miller	9.4%
	Merchants from other Changwat	-

b) From Merchants

Merchants	Merchants in Tambol	16.7%
	Merchants in Amphoe	25.0%
	Merchants in city	25.0%
	Merchants from other Changwat	

Remarks: 1. Almost all production of mungbean is estimated sold from farmers.

2. A little more than 80% is purchased within Tambol.

Source: ibid

5. Soybean

a) From Farmers

Farmers	Merchants in village	48.8%
	Merchants in Tambol	9.3%
	Merchants in Amphoe	14.0%
	Merchants in other Amphoe	-
	Merchants in city	27.9%
	Merchants from other Changwat	-
	Others	

b) From Merchants

Merchants	Merchants in Tambol	5.9%
	Merchants in Amphoe	5.9%
	Merchant in city	52.9%
	Merchant in Bangkok	23.5%
	Merchant in other Changwat	11.8%

Remarks: 1. Almost 95% of production is estimated to be sold to merchants after threshing and 70% of them purchased within Amphoe.

2. From primary merchants, 24% moves to Bangkok and other 12% moves to other Changwats. 35.3% of Chiang Mai soy bean, then, moved out of Changwat.

3. A little more than 50% is retained in City use.

Source: ibid

4. Garlic

a) From Farmers

Farmers	Merchants in village	31.6%
	Merchants in Tambol	13.1%
	Merchants in Amphoe	13.2%
	Merchants in other Amphoe	5.3%
	Merchants in city	18.4%
	Others	18.4%

b) From Merchants

Merchants	Merchants in Tambol	12.5%
	Merchants in Amphoe	16.7%
	Merchants in other Amphoe	-
	Merchant in city	20.8%
	Merchants in Bangkok	29.2%
	Merchants in other Changwat	20.8%

Remarks: 1. Almost 60% of farmers sales is purchased by merchants in the same Amphoe.

2. From primary merchants, 30% moves to Bangkok and another 20% moves other Changwats and then almost 50% of primary merchants sales moved out of Chiang Mai.

Source: ibid

5. Vegetables (Tomato, Chinese Cabbage)

a) From Farmer

Farmers ——

Merchants in village	45.4%
Merchants in Tambol	9.1%
Merchants in Amphoe	9.1%
Merchants in other Amphoe	9.1%
Merchants in city	18.2%
Others	9.1%

b) From Merchants

Merchants ——

Merchants in Tambol	-
Merchants in Amphoe	-
Merchant in other Amphoe	-
Merchants in city	75.0%
Others	25.0%

Remarks:
1. About 60% of farmers sales is purchased by merchants within same Amphoe.
2. 75% of sales of merchants moved to city and 25% moves to hospitals and other institutions.

Source: ibid

6. Sweet Corn

a) From Farmers

Farmers	Merchants in village	45.4%
	Merchants in Tambol	27.2%
	Merchants in Amphoe	18.2%
	Merchants in city	9.2%

b) From Merchants

Not available

Remarks:

1. Almost all sweet corn purchased by merchants within same Amphoe and only a little less than 10% is sold to merchants in city.

2. It is presumed that most of sweet corns are consumed, because sweet corn is boiled or streamed before being handled further by merchants.

Source: ibid