A-3. IMPACT ON IRRIGATION

[1] General

1-1 Purpose of Field Investigation

Upper Mae Yuam 1 Project is located in the upstream reach of the Yuam river basin. There are several irrigation projects using the water resource of the main and tributaries of the Yuam river in the investigation area extending between Upper Mae Yuam 1 Project and the end of the Lower Nam Yuam Reservoir.

It is necessary for Upper Mae Yuam 1 Project to study its power scheme taking into consideration the impact on the existing and future irrigation project in the said investigation area.

The purpose of field investigation is to examine about impact on the downstream irrigation which will be caused by Upper Mae Yuam 1 Project.

1-2 Study Item of Field Investigation

JICA-Team made field investigation in the abovementioned area placing emphasis on the following items for a period from 23rd November to 8th December 1985.

(1) Existing condition and operation works of the irrigation projects which have been constructed by Royal Irrigation Department (referred to as RID) and Rural Acceleration Development (referred to as RAD)

(2) Possibility of future irrigation projects in the Mae Sariang Plain

(3) Various agriculture information on cropping schedule, yield and price etc. in the existing RID Irrigation Project in the Mae Sariang Plain

1-3 Result of Field Investigation

JICA-Team collected the data and/or information of agriculture and irrigation by means of interview to villagers, RID office and Agriculture office etc., as well as observation of topographic feature in the investigation area. The results of investigation were summarized as follows.

(1) The right bank area of the Yuam river in the Mae Sariang plain (approximately 12,500 rai) has been brought into irrigation by Large-medium Scale Irrigation Project of RID and used the river water of the Yuam river through the year.

(2) There is little possibility of land to economically develop new irrigation areas by the main Yuam river because of topographical constraint within the investigation area.

(3) Irrigation requirement at the RID diversion weir is maximum 2.94 cu.m/sec for the existing RID Irrigation Project at present and in future.

(4) In case that the river run-off in the dry season would be improved by Upper Mae Yuam 1 Project, cropping intensity in the dry season will increase in the existing RID Irrigation Project area.

[2] Description of Investigation Area

2-1 Agriculture

The production of agriculture and fishery sector ranks the first in Thailand remarkably exceeding other sectors as shown in Table-1 and the export amount of the said sector is approximately 65% of total export in 1983 in monetary term as shown in Table-2.
The sector of agriculture and fishery, therefore, has been long regarded to be staple industry in Thailand.

Export of rice is over 20% of total amount of export of agriculture products in monetary terms, which is playing important role in the national economy of Thailand, together with cassava, maize, sugar and rubber.

The planted area and production of rice in 1983/84 Crop Year was 62.6 x 10 million rai and 19.5 x 10 million ton (in paddy) respectively as shown in Table-3. Farm-gate price of paddy was 2.8 Baht/kg in 1983/84 and 2.5 to 3.0 Baht/kg in December 1985. On the other hand, FOB price of rice in Bangkok Port was 5.6 Baht/kg in 1983/84 and 5.7 Baht/kg in December 1985.

In Mae Hong Son Province including the project area, paddy field is approximately 68% (159,119 rai) of the total arable land in the rainy season followed by 18% with the field crops of soybean etc. and 5% with fruit trees. Major crops, harvested area and yield in Mae Hong Son Province are indicated in Table-5.

2-2 Irrigation Projects

There is the existing large-medium scale irrigation project constructed by RID in 1976 which is called as Nam Yuam Irrigation Project and takes the water of the Yuam river into the Mae Sariang Plain. Besides, there are several small-scale irrigation schemes constructed by RID and RAD within the investigation area, each of which uses the water of tributary of the Yuam river.

2-2-1 Existing Nam Yuam Irrigation Project

(1) General

The construction work of the existing Nam Yuam Irrigation Project - Large-medium Scale Project - was commenced in 1967 and completed in 1976 by RID. The operation of the Project has been undertaken by RID.

The irrigation water is diverted at the RID diversion weir which is located at 25km downstream of Upper Mae Yuam 1.

The project description is as follows.

Irrigation Area	:	12,500 rai in the right bank 4,500 rai in the left bank (not completed as of the end of 1985)
Water Requirement at Diversion Site	:	Maximum 2.94 cu.m/sec
Diversion Weir	:	Height 2.5m Crest Length 110m of concrete 87m of embankment
Main Canal	:	22.58km of concrete lining canal
Project Cost	:	45.22 million Baht (in 1974)
Household	:	Approximately 5,000
Average Size of Farm	:	3 - 5 rai
Soil	:	Loam to Sandy loam

In the irrigation area of 12,500 rai, major crop in the rainy reason is paddy and in the dry season generally soybean followed by ground nut, garlic and paddy in limited area.

Diversion of the irrigation water from the Yuam river usually starts in early May and continues until late October for the rainy season paddy. Irrigation water for the dry season crops is used from early December to April as indicated in Table-7.

The yield of paddy is 500 or 600 kg/rai and farm-gate price is 2.5 to 3.0 Baht/kg according to the investigation made in December 1985. The cropping intensity in the dry season is approximately 60% in the irrigation project area which is higher than rain-fed area.

Cropping intensity forecasted by RID Project Office is 75% for the dry season starting December 1985 and RID expects 100% in near future if the river water could be available. Irrigation water in the dry season, however, is not enough now because the run-off of the Yuam river is very small in March and April.

According to the interview to villagers in the irrigation area, approximately 5% of the total area which are located in several meandered portions along the Yuam river has been inundated every year by flooding of 0.5 - 2 m in depth lasting 3 or 5 days.

(2) Irrigation Requirement at RID Diversion Weir

The data recorded from 1977 to 1984 of the river run-off, diverted irrigation water and over-flow discharge at the RID diversion weir are shown in Tables 6,7 and 8 and indicated in Fig.-1.

These data are summarized as follows.

The river run-off at the RID weir is 637.15 MCM in average and 55.78 MCM out of the said amount is diverted for irrigation purpose.

	Run-off at RID Weir			Irr. Amount		Irr. Requirement		
Year (Jan.-Dec.)	Average (cu.m/s)	Max. (cu.m/s)	Min. (cu.m/s)	Am't (MCM)	Irr. Day (Day)	Average (cu.m/s)	Max. (cu.m/s)	Min. (cu.m/s)
1977	25.27	194.14	3.71	34.45	295	1.09	3.06	0
1978	29.00	152.99	3.19	50.38	297	1.60	3.35	0
1979	16.18	118.28	4.21	N.A.	N.A.	N.A.	N.A.	N.A.
1980	23.65	284.08	1.13	53.28	301	1.69	3.35	0
1981	18.39	158.21	1.39	56.63	328	1.80	3.95	0
1982	24.04	161.89	1.39	55.37	327	1.76	3.35	0
1983	14.11	102.15	1.20	56.92	335	1.80	3.12	0
1984	20.83	162.70	1.82	56.81	327	1.79	3.26	0
Average (1980-1984)	20.20 (637.15 MCM)	173.86	1.39	55.78	323.5	1.77	3.41	0

(3) Cropping Pattern

Approximately 95% of the total irrigation area (12,500 rai at present) is used for paddy in the rainy season (June to November) and the balance for soybean and ground nut. In the dry season

about 60% of the total irrigation area is used for the field crops consisting of soybean (approximately 6,750 rai) in the main, paddy (approximately 400 rai), garlic, tobacco and peanut etc.

The cropping pattern in the irrigation area is assumed as shown in Fig.-2 based on the information collected during the field investigation.

(4) Irrigation Requirement

The amount of irrigation requirement in the rainy season and the dry season is estimated in Fig.-2 and Table-7. It is summarized as follows.

Irrigation Requirement: 32.60 MCM for 12,500 rai
in Rainy Season

Irrigation Requirement: 23.18 MCM for 7,500 rai
in Dry Season

2-2-2 RID Small-scale Irrigation Project

Small-scale Irrigation Projects were constructed by RID and use the water resource of tributary of the Yuam river for irrigation purpose. Location and project area of each project is shown in Fig.-3.

2-2-3 RAD Irrigation Project

Irrigation project is one of important Rural Accelerated Development projects which have been executed by the Ministry of Interior. There are two RAD irrigation projects in the vicinity of Mae Sariang constructed by RAD and operated by peoples association as shown in Fig.-3.

[3] Impact and Agriculture Benefit

3-1 General

As stated in the previous sections, there is little possibility of land to economically develop new irrigation areas using the water of the main Yuam river.

Since the land utilization in the rainy season has been attainted to 100% in the RID Irrigation Project Area, further extention of irrigation area can not be expected in the rainy season.

Impact and/or benefit can be expected to increase by intensifying the land-use of the dry season from 60% (7,500 rai) to 100% (12,500 rai) in the irrigation area. Because the minimum discharge to be released at Upper Mae Yuam 1 Project is estimated to be more than 12 cu.m/sec, which is sufficient for the irrigation requirement of 12,500 rai in the RID Nam Yuam Irrigation Project.

3-2 Incremental Agriculture Benefit

Incremental benefit due to the said increasing cropping intensity in the dry season can be estimated in terms of increased production of soybean which is major dry season crop.

Average yield of soybean is approximately 300kg/rai and its farm-gate price is 6 Baht/kg in December 1985.

Gross value before production cost is accordingly estimated to be 1,800 Baht/rai. Assumed that the ratio of production cost of soybean is 40% of gross value, net profit after production cost will be 1,080 Baht/rai.

Incremental agriculture net benefit is estimated as shown below to be 5.40 million Baht/year which will be brought by increasing of the land-use by 5,000 rai in the dry season.

Yield of Soybean : 300 kg/rai

Farm-gate Price : 6 Baht/kg

Gross Value	:	1,800 Baht/rai
Net Profit	:	1,080 Baht/rai
Incremental Area	:	5,000 rai
Incremental Benefit	:	5.4 million Baht/yr.

Table–1 Gross Domestic Product by Economic Sector (Nominal)

Value / Economic Sector	Value (million Baht)			Percentage (%)		
	1982	1983	1984	1982	1983	1984
Agriculture	188,742	204,443	198,273	22.3	22.1	20.0
Crops	139,852	149,973	143,706	16.5	16.2	14.5
Livestocks	23,608	28,840	28,397	2.8	3.1	2.9
Fisheries	14,150	14,466	14,055	1.7	1.6	1.4
Forestry	11,132	11,164	12,115	1.3	1.2	1.2
Mining and Quarrying	14,807	16,480	20,165	1.7	1.8	2.0
Industries	164,659	176,200	189,268	19.5	19.1	19.1
Construction	43,040	47,129	51,231	5.1	5.1	5.2
Electricity and Water Works	14,454	16,319	17,250	1.7	1.8	1.7
Transportation & Communication	63,133	73,708	82,513	7.5	8.0	8.3
Wholesale & Retail Trade	159,849	165,812	184,967	18.9	17.9	18.7
Banking, Insurance, Real Estate	61,021	71,722	80,514	7.2	7.8	8.1
Residence	9,912	11,210	12,413	1.2	1.2	1.3
Public Administration Defence	37,349	42,551	47,143	4.4	4.6	4.8
Services	89,170	98,680	108,015	10.5	10.7	10.9
G D P	846,136	924,254	991,752	100.0	100.0	100.0
G N P	819,760	898,884	960,405			
Per Capita GNP	16,906	18,174	19,056			

Source: National Income of Thailand (1984)

Table–2 Quantity & Value of Principal Agricultural Export and Total Export

	1981		1982		1983	
	Q'ty(t)	Value(฿)	Q'ty(t)	Value(฿)	Q'ty(t)	Value(฿)
Total Value of Export (10^6)		153,000.7		157,728.2		148,602.6
Agricultural Export (10^6)		101,491.9		107,836.4		95,985.1
Total Rice Export (10^3)	3,031.8	26,367	3,784.2	22,510	3,534.2	20,100
White Rice					2,622.3	
Glutinous Rice					78.6	
Cargo Rice					49.4	
Rice parboiled					784.0	
Export Price of Rice (฿/ton) 1/		8,697		5,948		5,618
Food Crops						
Maize (10^3)	2,547.4	8,236	2,801.2	8,231	2,646.4	8,386
Cassava Products (10^3)	6,266	16,447	7,815	19,752	5,199	15,386
Raw Sugar/Products (10^3)	1,574	10,311	3,135	13,807	2,301	7,560
Oil Seeds: Soybean (10^3)	2.53	22,570	1.30	11,397	1.04	9,272
Animal Feed: Soybean (10^3)	0.30	2,879	0.25	2,295	0.10	616

Source: Agricultural Statistics of Thailand (AST) Crop Year 1983/84

1/ Estimated export prices of rice in 1984 and 1985 are reported in the Bangkok Post of Dec. 12, 1985

Table–3 Area, Production and Yield or Principal Crops in Thailand
(Crop Year 1983/84)

	Planted Area (1000Rai)	Harvested Area (1000Rai)	Production (1000Rai)	Yeild (kg/rai)	Farm Price (฿/kg)	Farm Value (M฿)
Food Crops:						
Rice	62,596	60,038	19,549	326	2.83	55,389
Major Rice	58,115	55,628	16,943	305	2.82	47,846
Second Rice	4,481	4,410	2,606	591	2.89	7,543
Maize	10,552	9,792	3,552	363	2.40	8,526
Mungbean	3,022	2,803	288	103	7.14	2,059
Oil Crops:						
Soybeans	1,008	974	179	184	6.38	1,143
Ground nuts	783	753	147	194	6.55	960
Fiber Crops:						
Cotton	638	625	119	191	12.56	1,498
Other Crops:						
Chilli (Dried)	196	-	54	275	33.99	1,832
Shallot & Onions	97	-	159	1,650	9.73	1,549
Garlic	351	-	171	489	14.94	2,561
Tabacco (Dried)	244	-	40	163	50.32	1,993

Source: AST Crop Year 1983/84

Table–4 Land Holding for Agriculture (1982)

Unit: Rai

Farm Holding Land	Whole Kingdom	(%)	Mae Hong Son Province	(%)
Total Land	320,696,883	(100)	7,925,787	(100)
Forest Land	97,984,375	(31)	6,023,750	(76)
Unclassified Land	99,125,715	(31)	1,742,918	(22)
Farm Holding Land	123,586,793	(38)/100	159,119	(2)/100
Farm Size	26.38		8.42	
Number of Farm	4,585,455		18,903	
Paddy Land	73,222,199	59	107,688	68
Field Crops Land	29,284,920	24	28,297	18
Fruit Tree & Tree Crop	11,873,182	10	8,221	5
Vegetable & Flowers	341,584	-	1,148	-
Grass Land	766,312	1	-	-
Idle Land	3,881,080	3	7,215	5
Other Land	4,217,516	3	6,550	4

Source: AST Crop Year 1983/84

Table–5 Principal Crops Cultivated in Mae Hong Son Province

		1982/83	1983/84
Rice	Harvested Area (10^3 Rai)	79,307	92,492
	Major Rice	71,347	82,386
	Second Rice	7,960	10,106
	Production (10^3 ton)	38,683	41,488
	Major Rice	35,642	37,377
	Second Rice	3,041	4,111
	Yield per Rai (kg)		
	Major Rice	500	454
	Second Rice	382	407
Soybeans	Harvested Area (10^3 Rai)	16,430	18,779
	Production (ton)	1,839	2,773
	Yield per Rai (kg)	112	148
Ground nuts	Harvested Area (Rai)	18,022	12,790
	Production (ton)	3,352	2,686
	Yield per Rai (kg)	186	210

Source: AST Crop year 1983/84

Table–6 Run-off of Nam Yuam River Estimated at RID Diversion Weir

(Unit: cu.m/s)

Y	Q	MONTH												
		J	F	M	A	M	J	J	A	S	O	N	D	Average
	AVE	14.03	9.70	5.41	10.36	11.04	13.87	22.46	37.82	88.76	44.83	26.91	17.84	25.27
	MAX	38.04	12.94	8.13	21.28	17.36	20.34	55.95	107.94	194.14	63.72	39.93	30.14	194.14
	MIN	10.08	7.10	3.71	5.02	3.95	7.19	9.10	17.77	46.83	31.82	22.37	13.21	3.71
	AVE	15.07	8.52	7.60	4.87	8.14	8.53	49.10	66.37	83.27	49.69	26.04	19.04	29.00
	MAX	38.54	17.77	17.77	10.53	15.94	19.00	123.96	129.74	152.99	97.72	31.51	23.71	152.99
	MIN	8.59	6.56	3.87	3.32	3.19	3.34	9.45	32.58	50.64	31.32	23.33	15.94	3.19
	AVE	13.53	9.00	5.63	5.72	11.46	13.55	18.09	35.94	30.77	30.21	11.91	7.59	16.18
	MAX	15.94	10.66	7.19	21.88	33.69	30.30	28.57	66.69	53.58	118.28	16.17	11.48	118.28
	MIN	10.66	8.29	4.21	4.21	5.14	6.14	9.41	13.93	17.82	13.62	9.98	5.19	4.21
	AVE	4.38	2.96	2.40	3.32	11.67	21.07	26.71	39.92	90.85	42.20	21.77	16.65	23.65
	MAX	6.09	3.70	3.27	10.39	70.94	66.36	70.63	110.56	284.08	100.13	21.31	51.84	284.08
	MIN	3.70	1.98	1.98	2.54	1.13	6.14	12.98	15.82	38.76	22.57	17.96	11.91	1.13
	AVE	8.50	4.99	2.74	2.80	5.51	12.49	23.26	54.40	43.98	28.17	20.60	12.17	18.39
	MAX	12.44	6.84	4.58	6.02	8.40	22.43	68.90	158.21	80.54	53.37	45.74	15.05	158.21
	MIN	6.82	3.56	1.93	1.39	2.13	7.52	6.93	26.52	20.60	19.22	15.62	8.78	1.39
	AVE	6.76	3.49	1.83	3.61	8.06	22.73	22.16	52.17	69.91	58.21	24.46	13.85	24.04
	MAX	8.78	4.92	2.17	15.11	24.35	70.94	51.76	92.25	161.89	129.73	31.21	18.83	161.89
	MIN	4.92	2.17	1.39	1.85	2.29	11.38	13.45	27.87	37.95	27.69	18.32	8.19	1.39
	AVE	8.05	5.13	3.57	2.35	2.45	6.13	8.08	21.53	37.98	38.57	24.07	10.99	14.11
	MAX	11.05	7.49	6.55	3.75	7.19	16.48	19.81	40.94	80.77	102.15	56.50	17.36	102.15
	MIN	5.05	3.56	2.20	1.43	1.20	2.44	3.62	13.09	18.35	18.90	15.82	8.30	1.20
	AVE	7.31	3.73	2.87	4.39	4.21	16.82	26.96	49.05	54.30	45.26	20.97	13.40	20.83
	MAX	10.11	5.24	3.37	6.84	7.19	29.57	50.96	158.13	162.70	88.01	29.44	17.36	162.70
	MIN	5.24	2.91	2.08	2.93	1.82	9.02	14.14	18.90	29.34	22.85	16.58	9.80	1.82

Table–7 Irrigation Water Diverted at RID Diversion Weir

(Unit: cu.m/s, CA: 2,617 sq.km)

Y	Q	MONTH												
		J	F	M	A	M	J	J	A	S	O	N	D	Average
	AVE	0.59	0.99	0.73	0.54	0.43	0.76	2.22	1.90	1.24	1.69	1.62	0.39	1.09
	MAX	1.09	1.09	1.72	1.10	0.93	2.03	3.06	2.27	2.20	1.83	2.57	1.01	3.06
	MIN	0.46	0.94	0	0	0	0	1.91	1.45	0	1.67	0.25	1.01	0
	AVE	1.07	1.39	1.96	2.10	0.88	0.72	1.98	2.24	2.01	1.96	2.15	0.71	1.60
	MAX	1.43	1.83	2.09	2.23	2.01	1.66	2.88	2.77	2.54	3.09	3.35	0.25	3.35
	MIN	0	1.15	1.83	2.01	0	0	0	1.79	1.52	0	0.25	0	0
	AVE MAX MIN						Not Available							
	AVE	1.88	1.93	2.34	2.69	1.12	0.03	1.75	2.40	1.50	2.32	1.82	0.44	1.69
	MAX	1.88	1.98	2.79	3.20	2.65	0.93	2.49	3.35	2.66	2.68	2.30	1.08	3.35
	MIN	1.88	1.88	1.98	2.65	0	0	0	1.91	0	1.97	0.60	0	0
	AVE	1.58	1.70	1.90	1.79	0.39	1.52	3.07	2.64	2.37	2.57	1.34	0.68	1.80
	MAX	2.17	1.75	2.04	2.52	1.51	2.09	3.49	3.49	2.71	3.95	2.61	1.69	3.95
	MIN	1.54	1.49	1.75	1.32	0	0.87	2.37	1.58	0	0	0.48	0	0
	AVE	1.70	1.39	1.52	1.82	0.73	1.05	2.85	2.44	2.65	2.57	1.48	0.87	1.76
	MAX	1.86	1.85	1.97	2.21	1.64	2.55	3.35	2.83	3.35	3.07	2.79	2.05	3.35
	MIN	1.58	0.99	0.99	1.64	0	0	2.55	1.83	2.04	2.09	0.45	0	0
	AVE	1.61	1.90	2.08	1.61	0.78	2.01	2.43	2.43	2.23	2.69	1.32	0.57	1.80
	MAX	1.71	2.34	2.34	1.97	1.22	2.44	2.44	2.70	2.96	3.12	2.61	1.11	3.12
	MIN	1.58	1.71	1.97	1.20	0	1.33	2.35	1.26	0	1.71	0.49	0	0
	AVE	1.43	2.23	2.50	2.01	0.38	1.60	1.86	2.59	2.05	2.56	1.55	0.80	1.79
	MAX	1.90	2.69	3.13	3.13	0.86	1.86	2.96	3.26	3.20	2.79	2.70	1.78	3.26
	MIN	0.65	1.55	1.25	0.67	0	1.14	0	1.38	0	2.32	0.65	0	0
	AVE	1.64	1.83	2.07	1.98	0.68	1.24	2.39	2.50	2.16	2.54	1.50	0.67	21.21
	Volume (MCM)	4.39	4.59	5.54	5.13	1.82	3.21	6.40	6.70	5.60	6.80	3.89	1.79	55.78

Note: Total Amount of Irrigation Water
From Dec. to May 23.18 MCM
From June to Nov. 32.60 MCM

Table–8 Overflow Discharge at RID Diversion Weir

(Unit: cu.m/s, A: 2,617 sq.km)

Y	Q	MONTH												
		J	F	M	A	M	J	J	A	S	O	N	D	Average
	AVE	13.44	8.71	4.68	9.82	10.62	13.11	20.24	35.92	87.52	43.14	25.29	17.44	24.18
	MAX	37.36	11.91	7.19	20.34	17.36	20.34	53.26	105.68	194.14	61.89	37.36	30.15	194.14
	MIN	9.45	6.14	2.54	4.21	3.34	7.19	7.19	15.94	45.08	30.15	21.88	13.21	2.54
	AVE	14.00	7.13	5.65	2.77	7.26	7.82	47.12	64.13	81.26	47.73	23.89	18.97	27.46
	MAX	37.36	15.94	15.94	8.30	15.94	17.36	121.92	127.50	150.65	95.29	28.42	23.46	150.65
	MIN	7.19	5.15	1.82	1.18	1.18	2.54	9.45	30.15	49.11	28.44	20.34	15.94	1.18
	AVE	13.33	9.00	5.63	5.72	11.46	12.49	15.03	33.06	27.42	27.09	9.59	7.04	14.80
	MAX	15.94	10.66	7.19	21.88	33.69	28.42	25.08	64.11	51.17	116.42	13.21	10.66	116.42
	MIN	10.66	8.30	4.21	4.21	5.15	6.14	6.14	10.66	14.55	10.66	7.19	3.34	3.34
	AVE	2.50	1.02	0.06	0.63	10.55	21.04	24.96	37.52	89.35	39.89	19.95	16.21	21.97
	MAX	4.21	1.82	1.18	7.19	70.94	66.36	68.64	108.33	284.08	97.85	25.08	51.17	284.08
	MIN	1.82	0.0	0.0	0.0	0.0	6.14	10.66	13.21	37.36	20.34	17.36	10.66	0.00
	AVE	6.92	3.29	0.82	1.02	5.12	10.97	20.19	51.75	41.61	25.05	19.26	11.48	16.58
	MAX	11.91	5.15	2.54	4.21	8.30	20.34	66.36	156.64	77.99	51.17	45.02	14.55	156.64
	MIN	5.15	1.82	0.0	0.0	0.64	6.14	4.21	23.46	18.83	17.36	13.21	7.19	0.00
	AVE	5.07	2.11	0.30	1.79	7.33	21.67	19.31	49.73	67.26	55.64	22.98	12.98	22.28
	MAX	7.19	3.34	1.18	13.21	23.46	70.94	45.11	90.23	159.66	127.50	28.42	18.83	159.66
	MIN	3.34	1.18	0.0	0.0	0.64	9.45	10.66	25.08	35.51	25.08	17.36	6.14	
	AVE	6.44	3.23	1.48	0.74	1.67	4.12	5.65	19.10	35.76	35.88	22.75	10.42	12.31
	MAX	9.45	5.15	4.21	2.54	7.19	14.55	17.36	39.25	77.99	100.44	55.38	17.36	100.44
	MIN	3.34	1.82	0.23	0.0	0.0	0.0	1.18	10.66	15.94	15.94	13.21	7.19	0.00
	AVE	5.88	1.50	0.37	2.38	3.84	15.22	25.10	46.46	52.26	42.70	19.42	12.60	19.04
	MAX	9.45	3.34	1.82	6.14	7.19	28.42	49.11	156.64	162.70	85.26	26.73	17.36	162.70
	MIN	3.34	0.23	0.0	0.0	1.82	7.19	11.91	15.94	26.73	20.34	15.94	8.30	0.00

Table–9 Precipitation at Mae Sariang Station

(Unit: mm/10-days)

Y	Period (day)	MONTH											
		J	F	M	A	M	J	J	A	S	O	N	D
	Early	75.10	11.50	0.00	56.60	3.30	8.20	45.60	36.20	141.70	58.60	8.50	0.00
	Middle	0.00	0.00	0.00	62.90	51.10	49.10	41.50	62.30	47.90	53.30	0.00	0.00
	Late	0.00	0.00	18.00	0.00	38.80	66.60	93.10	85.80	43.90	27.10	1.70	60.30
	Early	24.60	6.20	0.00	0.00	3.00	25.10	144.40	90.00	37.80	114.40	0.00	0.00
	Middle	10.20	0.00	0.00	17.70	124.50	51.10	61.30	82.30	80.80	20.10	0.00	0.00
	Late	0.00	6.80	0.00	0.00	34.60	57.90	38.70	71.70	138.60	21.10	0.00	0.00
	Early	0.00	0.00	0.00	0.00	29.30	63.10	34.30	65.70	53.20	52.40	0.00	0.00
	Middle	0.00	0.00	0.00	8.50	53.30	105.90	56.30	110.50	43.00	0.50	0.00	0.00
	Late	0.00	0.00	0.00	52.20	60.30	54.60	24.20	97.10	139.20	6.90	0.00	0.00
	Early	0.00	0.00	0.00	0.00	9.40	62.40	19.90	31.30	193.50	85.30	25.30	11.60
	Middle	0.00	0.00	0.00	0.00	23.00	46.60	74.70	57.80	77.50	66.60	16.80	23.90
	Late	0.00	0.00	0.60	0.00	269.80	82.20	98.20	108.60	114.10	0.90	0.40	0.00
	Early	0.00	0.00	0.00	0.00	9.50	74.00	102.80	107.70	77.10	34.00	13.80	3.90
	Middle	0.00	0.30	0.00	29.30	31.10	151.30	15.00	58.90	21.20	46.30	14.90	4.90
	Late	0.00	0.00	3.00	3.50	23.40	53.80	45.30	42.30	80.00	16.70	0.20	0.20
	Early	0.00	0.00	0.00	25.60	53.80	69.50	57.60	59.40	89.50	14.20	0.00	0.00
	Middle	0.30	0.00	0.00	0.10	127.50	57.30	4.30	93.60	47.20	37.90	0.00	0.00
	Late	0.00	0.00	0.00	0.00	145.30	78.00	42.40	47.80	42.30	4.10	10.80	0.00
	Early	0.00	0.00	0.00	0.00	0.00	36.00	34.40	61.60	103.90	64.40	0.00	0.00
	Middle	0.00	0.00	0.00	0.10	1.20	37.30	95.40	68.50	13.30	66.10	0.00	0.00
	Late	0.00	0.00	0.00	0.00	68.10	12.80	102.80	56.10	42.50	1.50	0.00	0.00
	Early	0.00	0.00	0.00	0.00	10.60	47.20	55.40	49.70	163.50	51.00	0.00	0.00
	Middle	0.00	0.00	0.00	36.40	17.80	135.60	42.50	67.40	14.90	43.90	0.00	0.00
	Late	0.00	0.00	0.00	39.10	78.60	83.30	86.40	91.50	54.60	8.70	0.00	0.00

Fig. 1 Diverted Discharge for the Nam Yuam Irrigation Project and River Run-off at RID Diversion Weir (1/3)

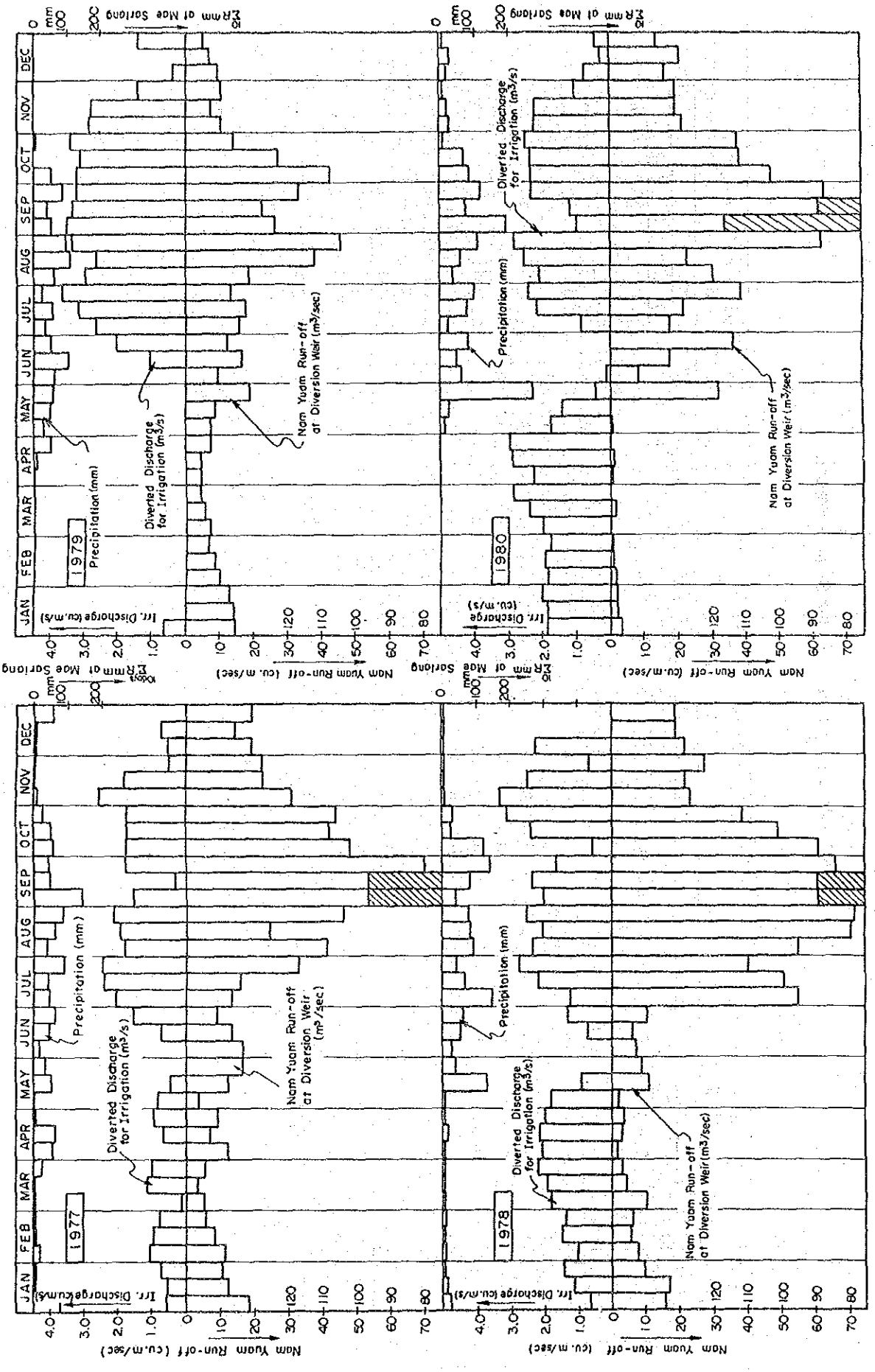


Fig. 1 Diverted Discharge for the Nam Yuam Irrigation Project and River Run-off at RID Diversion Weir (2/3)

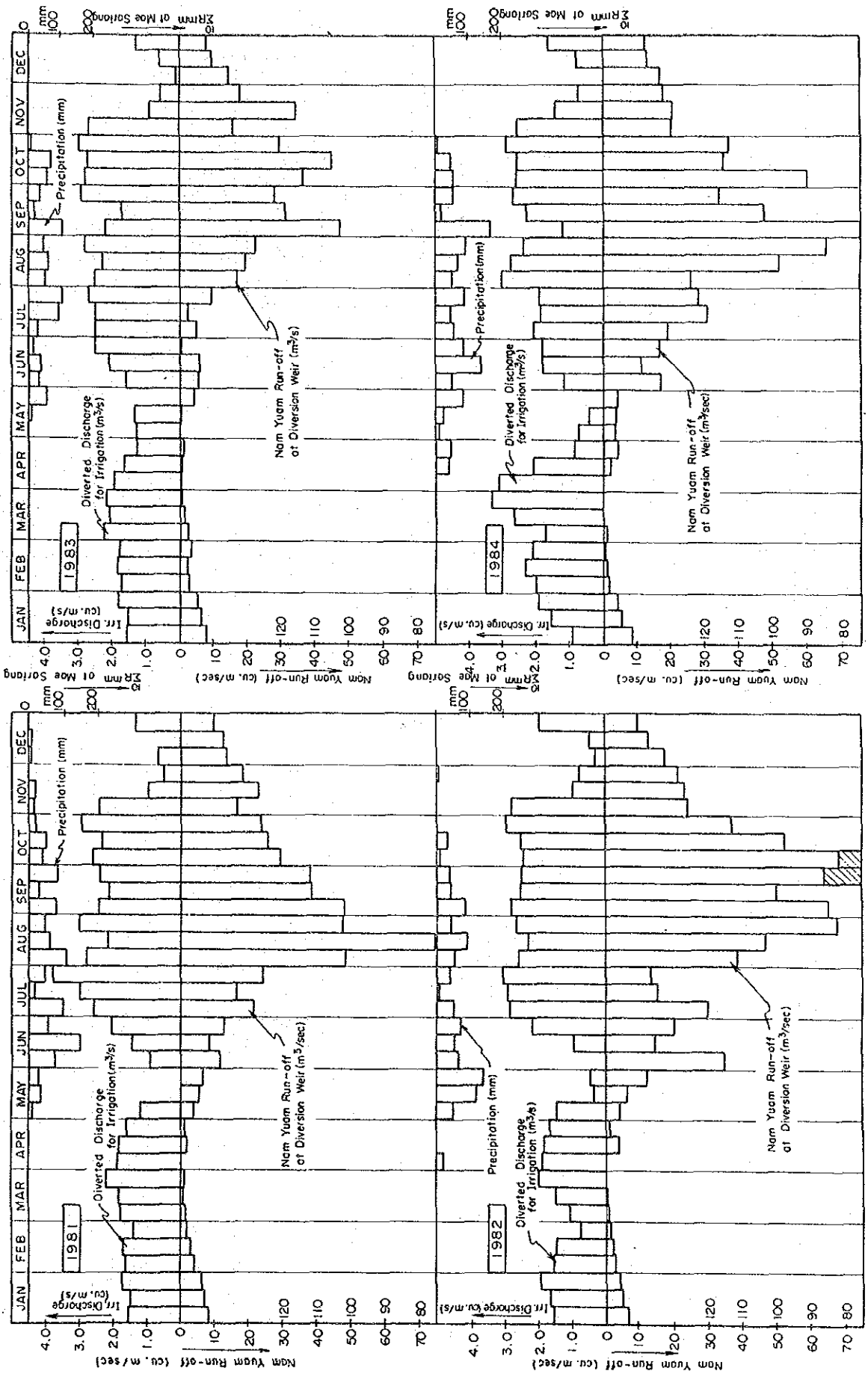


Fig. 1 Diverted Discharge for the Nam Yuam Irrigation Project and River Run-off at RID Diversion Weir (3/3)

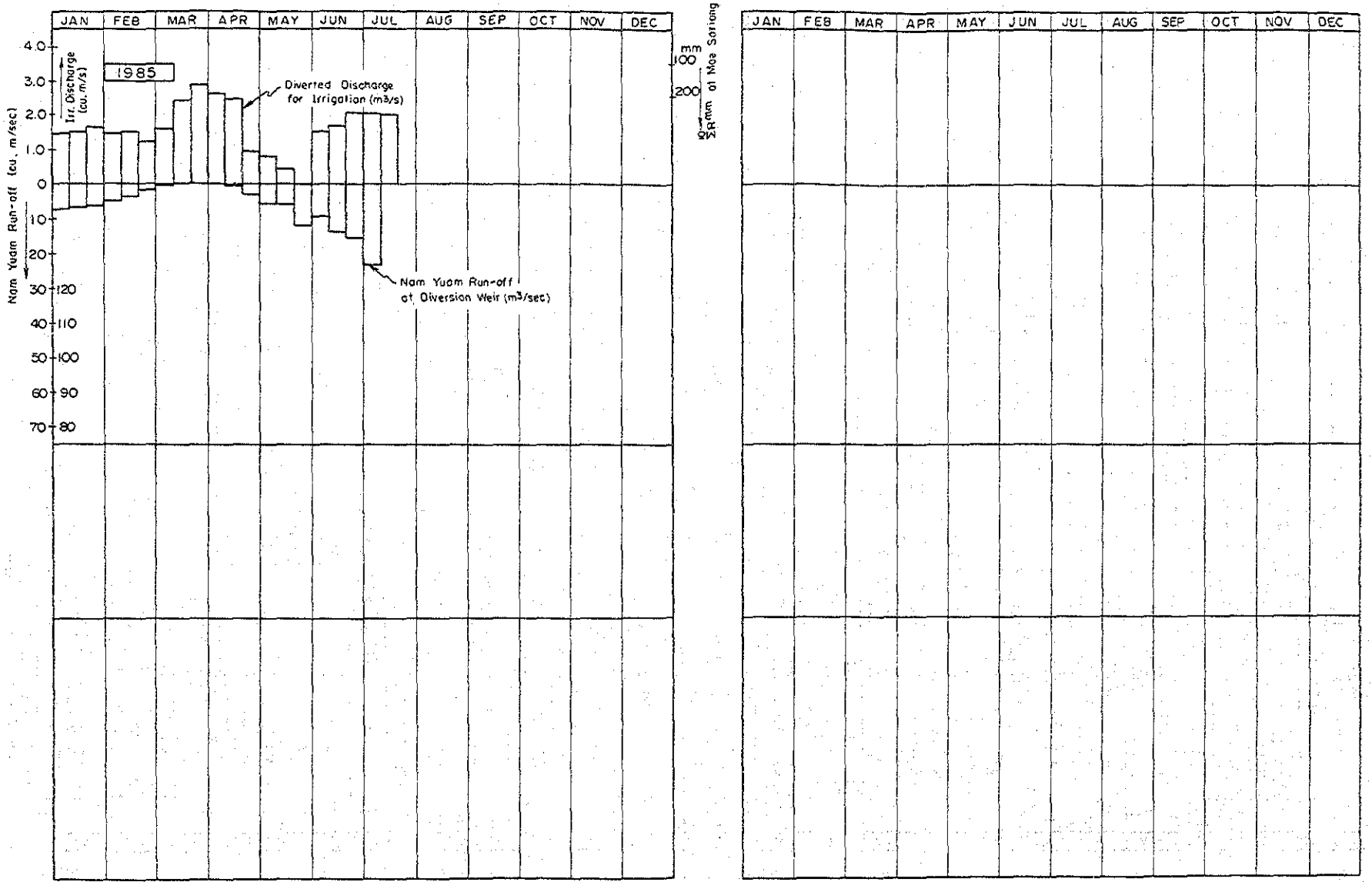


Fig. 2 Typical Cropping Pattern and Irrigation Requirement in RID Nam Yuam Irrigation Area

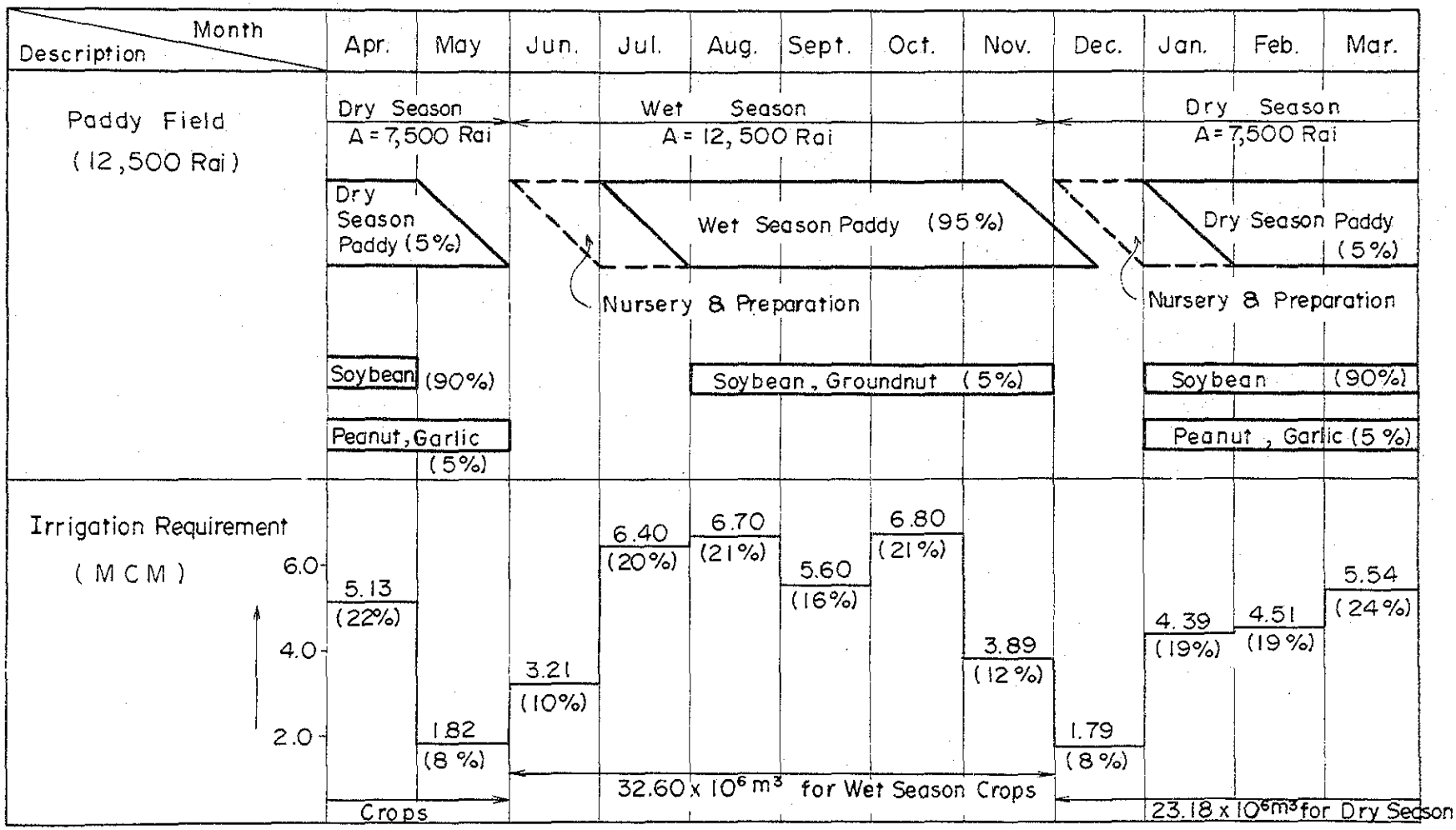
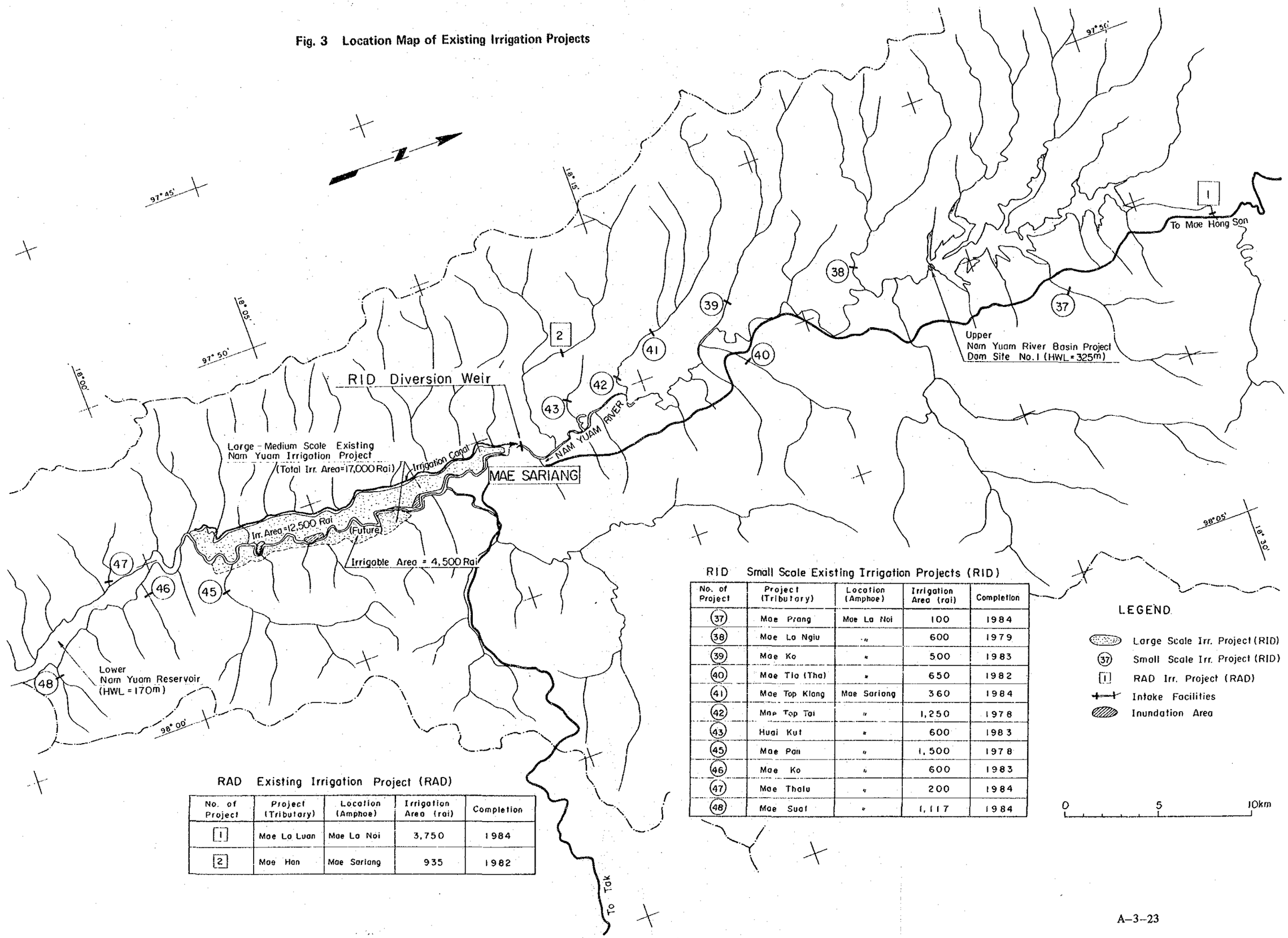


Fig. 3 Location Map of Existing Irrigation Projects



RAD Existing Irrigation Project (RAD)

No. of Project	Project (Tributary)	Location (Amphoe)	Irrigation Area (rai)	Completion
[1]	Mae La Luan	Mae La Noi	3,750	1984
[2]	Mae Han	Mae Sariang	935	1982

RID Small Scale Existing Irrigation Projects (RID)

No. of Project	Project (Tributary)	Location (Amphoe)	Irrigation Area (rai)	Completion
(37)	Mae Prang	Mae La Noi	100	1984
(38)	Mae La Ngiu	"	600	1979
(39)	Mae Ko	"	500	1983
(40)	Mae Tia (Tha)	"	650	1982
(41)	Mae Top Klang	Mae Sariang	360	1984
(42)	Mae Top Tai	"	1,250	1978
(43)	Huai Kut	"	600	1983
(45)	Mae Pan	"	1,500	1978
(46)	Mae Ko	"	600	1983
(47)	Mae Thalu	"	200	1984
(48)	Mae Suat	"	1,117	1984