ANNEX VII I RRIGATION AND DRAINAGE

ANNEX - VII

IRRIGATION AND DRAINAGE

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ANNEX-VII

IRRIGATION AND DRAINAGE

1. INTRODUCTION

The Sakae Krang river basin extends over the northwestern part of the Central Chao Phraya Plain with a total area of about 6,300 km². The river basin is bounded by the mountain ridges on the west, the Chao Phraya river on the east, the northern ridge of the Mae Wong river on the north and southern ridge of the Khok Khwai river on the south. Administratively, the basin is located within the jurisdictions of four provinces (Changwat), i.e., Khampheng Phet, Nakhon Sawan, Uthai Thani and Chainat.

Irrigation development in the Sakae Krang river basin has been commenced in late 1970s by RID. At present, there exist one large scale, five medium scale and 50 small scale irrigation projects in the river basin. The basin is graced with extended land resources quite suitable for agricultural production. Nevertheless, the land productivity is still low due to various constraints for agricultural development. The major constraints are as follows:

- Annual shortage and uneven seasonal distribution rainfall,

- Serious shortage of irrigation water resources in the dry season,
- Lack of perennial irrigation system,
- Improper water management,
- Improper application of agricultural inputs, and insufficient and improper control of diseases, insects and rats, and
- Insufficient agricultural supporting services.

In order to solve the above constraints, the optimum development plan should be formulated through sufficient understanding and grasp of present conditions in the basin and technical and economical considerations and examination to them.

In this ANNEX, irrigation and drainage aspects for the optimum development are discussed laying emphasis on the irrigation and drainage water requirements and planning and design of project facilities.

2. EXISTING IRRIGATION PROJECT

2.1 General

As stated in CHAPTER 1, there exist one large scale irrigation project, five medium scale irrigation projects and 50 small scale irrigation projects in the Sakae Krang river basin. These projects have mainly been implemented during the recent 5 years by RID in response to the local people's request in the basin. The location map of existing irrigation projects is shown in Fig. VII-1.

2.2 Large Scale Irrigation Project

The Thap Salao Irrigation Project is the only large scale irrigation project in the basin (see Table VII-1). The irrigation service area of 88,000 rai (14,080 ha) is located in the southeastern part of the basin and extends west to east along the both banks of the Thap Salao river which is the main water source of the project. The major facilities of the project comprise a diversion weir constructed across the main stream of the Thap Salao river and main and lateral irrigation canal system. At present, the project is suffering from irrigation water shortage. The main reasons are as follows:

There exist three local-made weirs which cover the areas of 35,000 rai (5,600 ha) in total.
Much irrigation water to the areas is taken without proper water management.

- Since 1970, the upstream area of the project was rapidly opened from the forest to the agricultural land. Consequently, the run-off phenomena from the basin upstream of the project were severely changed. No stable perennial flow is presently expected.

For solution of water shortage problem, RID intends to implement the Thap Salao Dam Project.

2.3 Medium Scale Irrigation Project

(1) Wang Kun Pao and Khun Lard Boriban Regulators

There exist two channels to divert the water of the Mae Wong river. These channels were constructed by farmers themselves more than 20 years ago. After construction of these channels, much water of the Mae Wong river was diverted through these channels to outside of the Mae Wong river basin. Subsequently, downstream areas of the Mae Wong river were suffered from irrigation water shortage. In resoponse to the farmer's request downstream of the Mae Wong river, RID constructed the regulators at the heads of these channels in 1975 to 1977, namely Wang Kun Pao Regulator and Khun Lard Boriban Regulator (see Table VII-1). The Wang Kun Pao Regulator is located at the left bank of the Mae Wong river, 8 km downstream of the proposed Lower Mae Wong Dam. The Regulator covers the irrigation service area of 105,000 rai (16,800 ha). The Khun Lard Boriban Regulator is located at the left bank of the Mae Wong river, 40 km downstream of the proposed Lower Mae Wong Dam. The irrigation service area covered by the Regulator is 55,000 rai (8,800 ha). No records on diversion water amount from the Mae Wong river at both regulators are available.

(2) Khlong Nam Hom Irrigation Project

The Khlong Nam Hom area of 10,000 rai (1,600 ha) is located at the right bank of the Mae Wong river, middle part of the Mae Wong river basin (see Table VII-1). The main water source for irrigation is the Mae Wong river. The return flow from the small scale irrigation project areas along the left bank of the Khlong Pho river is used for augmentation of irrigation for the area. The major facilities of the project comprise a diversion weir constructed in 1975 to 1976 by RID and canal system constructed by farmers.

(3) Wang Rom Klao Irrigation Project

The Wang Rom Klao area of 12,500 rai (2,000 ha) is located at both banks of the Sakae Krang river, 10 km downstream of confluence of the Mae Wong and Khlong Pho rivers (see Table VII-1). The main water sources are the Mae Wong, the Khlong Pho and the Huai Thap Salao rivers. The major facilities of the project consist of an earth fill dam, spillway, intake structures and canal systems constructed by farmers.

(4) Khlong Yang Irrigation Project

The Khlong Yang area of 7,500 rai (1,200 ha) is located at the right bank of Huai Thap Salao river, 7 km upstream of confluence of the Huai Thap Salao and Sakae Krang rivers. The water source is the Huai Thap Salao river. The main facilities of the project consist of a diversion weir, 3 intake structures and canal systems. These facilities were constructed in 1950 to 1954 and deteriorated at present. Rehabilitation works are required.

2.4 Small Scale Irrigation Projects

There exist small scale irrigation projects of 50 in number (see Table VII-2). The total irrigation service area of all projects is 256,600 rai (41,050 ha) which consist of 60,500 rai (9,680 ha) of the Mae Wong river basin, 53,800 rai (8,600 ha) of the Khlong Pho river basin, 66,500 rai (10,640 ha) of the Thap Salao river basin and 75,800 rai (12,130 ha) of the Khok Khwai river basin, respectively. Most of the projects were consturcted by RID in 1980 to 1984 and have canal systems constructed by farmers.

2.5 Pump Irrigation Services from RID

RID Regional Office VII provides pump irrigation services with free charge for the farmers who have rainfed paddy field along the rivers and streams in the basin. About 35 portable pump units are usually used for such services. The regulations of the services are as follows:

- Operation hours of pump unit are 22 hrs/day,

- Irrigation service period is 120 days, and

- The regulations limit farmers receiving the service for only one crop season, wet season or dry season.

The Regional Office VII uses the budget of 1 to 1.5 x 10^6 Bahts/ years for the services.

3. SELECTION OF PROJECT AREA

1

3.1 Basic Concepts on Irrigation and Drainage Development

In order to realize the concepts for agricultural development, the following basic concepts for irrigation and drainage development are envisaged in conformity with the concepts for water resources development.

- a) First priority for irrigation development would be given to the supplemental irrigation for wet season paddy in the existing irrigation areas.
- b) Possible further extension of irrigable area would be examined taking the topographic and soil conditions into consideration. If the exploited water resources are available, either the supplementant irrigation for the wet season paddy in the above extension area or the irrigation for dry season crop in the existing irrigation area would be considered.
- c) The natural streams in the basin would be used for drainage as many as possible. The collector drains would be provided for proper drainage in each scheme.

3.2 Mae Wong River Basin

As stated in Chapter 1 of this ANNEX, there exist smale and medium scale irrigation projects along the Mae Wong river, which cover the irrigation service area of 230,000 rai (36,800 ha) in total. Most of existing irrigation areas have an intake weir or regulator and irrigation canal system constructed by farmers. These irrigation areas would be incorporated into the development plan. Other than the existing irrigation areas, there are following three potential areas, in where the paddy cultivation is made under rainfed condition:

- a) Potential area fo 30,000 rai (4,800 ha) on the right bank in the upstream reach of the Mae Wong river
- b) Potential area of 20,000 rai (3,200 ha) on the right bank in the middle to downstream reach of the Mae Wong river, and
- c) Potential area of 18,750 rai (3,000 ha) on the left bank in downstream reach of the Mae Wong river.

Total development area is tabulated as follows.

isting Irrigation Area	Rainfed Area	Total.
 230,000 rai	68,750 rai	298,750 rai
 (36,800 ha)	(11,000 ha)	(47,800 ha)

VII-5

The location map of irrigation development area in the Mae Wong river basin is shown in Fig. VII-2.

3.3 Khlong Pho River Basin

There exist small scale irrigation projects in the Khlong Pho river basin, which have the irrigation service areas of 53,800 rai (8,600 ha) in total. Other than these existing irrigation projects, a medium scale irrigation project, the Wang Rom Klao, is located at just downstream of the confluence of the Mae Wong river and the Khlong Pho river. The Wang Rom Klao has the irrigation service area of 12,500 rai (2,000 ha) and is originally irrigated by using the water from the Khlong Pho, because no available water from the Mae Wong can be expected. Accordingly, the Wang Rom Kao would be incorporated into the irrigation development plan for the Khlong Pho river basin.

The Khlong Pho river basin has the following potential areas, in where farmers enjoy the rainfed paddy cultivation:

- a) Potential area of 18,750 rai (3,000 ha), which extends on both banks in the upstream reach of the Khlong Pho river,
- b) Potential area of 12,500 rai (2,000 ha) on the left bank in the middle reach of the Khlong Pho river, and
- c) Potential area of 14,400 rai (2,300 ha) on the right bank in the downstream reach of the Khlong Pho river.

Existing Irrigation Area	Rainfed Area
56,300 rai	45,650 rai 101,950 rai
(10,600 ha)	(7,300 ha) (17,900 ha)

Total development area is summarized below.

The location of irrigation development area in the Khlong Pho river basin is shown in Fig. VII-2.

4. IRRIGATION AND DRAINAGE WATER REQUIREMENTS

4.1 Irrigation Water Requirements

4.1.1 General

Irrigation water requirements under the following two conditions are calculated:

a) Irrigation water requirements under the present condition are estimated based on the present cropping pattern in order to grasp the areas actually irrigated through the present water balance calculation.

b) Irrigation water requirements under the with-project condition are estimated based on the proposed cropping pattern in order to determine the project scale.

The calculation of irrigation water requirements is made on monthly basis through the following procedures:

a) Estimation of consumptive use of water by crop,

b) Estimation of percolation rate for paddy crop,

c) Estimation of water requirement for nursery and land preparation for paddy crop,

d) Estimation of effective rainfall, and

e) Estimation of diversion irrigation water requirement based on the overall irrigation efficiency.

4.1.2 Consumptive use of water by crop

(1) Cropping patterns

The cropping patterns for both present and with-project conditions are shown in Fig. VII-3 and Fig. VII-4, respectively.

(2) Potential evapotranspiration (ETp)

Since no data on the field measurement of consumptive use of water by crop are available in the Sakae Krang river basin, the consumptive use of water is estimated based on the potential evapotranspiration made by the authorized method.

The FAO Group on Crop Water Requirement recommends the following prediction method:

a) Blany - Criddle,

- b) Radiation,
 - v vijaž para vijuma u s
- c) Modified Penman, and
- d) Pan evaporation.

Among the above methods, it is said that the modified Penman method would offer the best results, if accurate climatic data are available. The modified Penman method is widely used in Thailand as well as the Asian countries.

Climatic data for about 30 years are available at Nakhon Sawan. Calculation of the potential evapotranspiration is made by the modified Penman method based on the climatic dat at Nakhon Sawan. The estimated potential evapotranspiration is shown in Table VII-3.

(3) Crop coefficient (Kc)

According to the Chao Phraya - Meklong Basin Study made by Acres International Limited, Canada, the crop coefficient in the Chao Phraya - Meklong Basin has been evaluated using evapotranspiration measurement at Samchock Experimental Station as shown below.

		Month	
lst	2nd	3rd	4th 5th
0.85	1.02	1.03	0.93 0.81
1,00	1.30	1.32	0.87 -
0.30	the straight state		0.80 -
	0.85	0.85 1.02 1,00 1.30 0.30 0.50	1st 2nd 3rd 0.85 1.02 1.03 1,00 1.30 1.32

These figures are used for estimation of consumptive use of water by crop.

(4) Consumptive use of water by crop (Cu)

The consumptive use of water by crop is calculated by the following formula.

Cu = Kc · ETp where, Cu : consumptive use Kc : crop coefficient ETp : potential evapotranspiration

4.1.3 Percolation rate (P)

The percolation rate of 1.0 mm/day is incorporated in the calculation of irrigation water requirements for paddy crop, in due consideration of textural profiles of representative soil extending over the river basin.

4.1.4 Water requirement for nursery and land preparation (WL)

The area required for nursery bed covers about 6 % of the cropping area. Nurseries are operated in the same area and during the same period as land preparation. Accordingly, it can be assumed that nursery water requirement is covered by supply water for land preparation.

The following figures are assumed for land satulation and ploughing, and standing water prior to transplanting.

Soil satulation	140	mm
Standing water	40	mm
	180	mm

Duration of land preparation = 30 days

The land preparation requirement is estimated by using Zijlstra and Van de Goor formula.

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W1 =	a ·	· · · · · · · · · · · · · · · · · · ·
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where,	Wl :	water requirement for land preparation (mm/day		
	a :	value of open water evaporation and percolation		
	b :	quantity of water needed for soil satulation and standing water (mm)		
	T :	duration of land preparation (day)		

Estimated water requirement for land preparation varies from 270 mm to 300 mm.

4.1.5 Effective rainfall (Re)

The effective rainfall is estimated by using the relationship curve between total and effective monthly rainfall derived from the Chao Phraya - Meklong Basin Study as shown Fig. VII-5. This curve was worked out through the simulation of field water levels in the present agricultural practice condition with minimal storage of field in the Chao Phraya - Meklong Basin. The effective rainfall estimated by this curve shows rather conservative figures than that by the "effective rainfall chart made by RID shown in Fig. VII-6. The effective rainfall for upland crop is estimated by the above RID's chart.

The monthly rainfall data at Thap Than station were used for estimation of effective rainfall.

4.1.6 Net water requirement and diversion water requirement

The net water requirement is calculated using the following formula:

Paddy

Wn = Cu + P + Wl - Re

Upland crop

Wn = Cu - Re

where, Wn : net water requirement

Cu : consumptive use of water

P : percolation rate

Wl : water requirement for land preparation including nersery requirement

Re : effective rainfall

The diversion water requirement is calculated by the following formula:

$Dw = Wn \times \frac{100}{2}$

E

where, Dw : diversion water requirement

Wn : net water requirement

: overall irrigation efficiency

Generally, the irrigation losses added to the net water requirement are the diversion water requirement. The irrigation losses consist of conveyance loss on the irrigation canal and application loss of the field. Factors affecting conveyance loss are size of the irrigation service area, canal lining and the technical and managerial facilities of water control on the canals. The application loss to the field is primarily affected by method and control of operation, the type of soils, length of field canals, size of the irrigation block, etc. The following overall irrigation efficiencies are assumed for calculation of diversion water requirement.

Present condition

Paddy : 45 %

Upland crop : 40 %

With-project condition

Paddy : 55 % Upland crop : 45 %

The calculated irrigation water requirements for the present conditions and with-project condition are shown in Table VII-4 to Table VII-6, respectively.

4.1.7 Unit design irrigation requirement

As shown in Table VII-6, the peak unit irrigation requirement for with-project condition varies from 0.547 l/sec/ha to 1.080 l/sec/ha. The peak unit irrigation water requirement with 5 year's return period is estimated at 0.9 l/sec/ha. The unit design irrigation requirement is determined at 1.0 l/sec/ha taking an allowance of 10 %.

4.2 Drainage Water Requirement

4.2.1 Present drainage condition

There exist no artificial drainage facilities in the Sakae Krang river basin. The natural streams formed in the basin are used for drainage. It was found through the field survey that there are no serious drainage problems in the upper and middle part of each sub-river basin. Only lowlying areas downstream of the Sakae Krang river, the Thap Salao river and the Khok Khwai river are inundated with the excess water of rainfall.

4.2.2 Standard for drainage plan

Taking the present drainage condition into consideration, the following basic concept for drainage development in the basin is envisaged in conformity with the concepts for irrigation development:

~ The natural streams in the basin would be used for drainage as many as possible. The collector drains would be provided for proper drainage in each scheme. The drainage water requirement is estimated in accordance with the following design standard which is generally applied to drainage plan in the humid Asian countries such as Thailand, Philippines, Malaysia and Indonesia:

a) Return period to design rainfall is five years,

b) Design rainfall is of three days - consecutive rainfall,

c) Design rainfall shall be drained off for three days,

d) On-field storage of an average surcharge of 75 mm.

4.2.3 Drainage water requirement

Design rainfall is determined based on the daily rainfall records at Thap Than.

Three days - consecutive rainfall

with return period of five years

Unit drainage water requirement is calculated by using the following formula.

170 mm

q = $\frac{(R-h) \times 10^{-3} \times 10,000 \times 10^{3}}{86,400 \times d}$

where, q : unit drainage water requirement (l/sec/ha)

R : design rainfall (mm)

h : on-field storage of an average surcharge (75 mm)
d : allowable duration of inundation (3 days)

Unit drainage water requirement is determined at 3.67 L/sec/ha.

5. PLANNING AND DESIGN OF PROJECT FACILITIES

5.1 General

The general features of each high priority project are to irrigate the area of 298,750 rai (47,800 ha) for the Lower Mae Wong and Upper Mae Wong Projects and the area of 101,950 rai (17,900 ha) for the Khlong Pho Project. The facilities required for the Project are intake weir, irrigation and drainage canals and their related structures.

For the planning and design of the project facilities, the following topographic maps are available.

(1) Topographic maps on a scale of 1/10,000 with a contour interval of 1.0 m

The maps cover only a part of upstream reaches of the Mae Wong and Khlong Pho river basins.

(2) Topographic maps on a scale of 1/50,000 with a contour interval of 20 m

These maps cover the whole Sakae Krang river basin.

A layout planning of main canal and lateral is made for both the Mae Wong and Khlong Pho river basins by using the topographic maps on a scale of 1/50,000. However, the scale and contour interval of the topographic map used for the layout planning are not sufficient to estimate the construction cost of irrigation facilities. Consequently, the model area located in the upstream reach of the Mae Wong river, where is covered by the topographic maps on a scale of 1/10,000 with a contour interval of 1.0 m, is selected for above purpose.

The planning and design of irrigation facilities for the model area are made to mainly estimate the work quantities and the construction cost (see Table VII-7).

5.2 Planning and Design of Irrigation Facilities for Model Area

5.2.1 Intake weir

The hydrological, geological and topographical conditions at the proposed intake weir site are not investigated yet at this moment. Planning and design of intake weir for the model area is made referring the existing intake weirs on the Mae Wong river.

An intake weir of ogee type would be constructed for the model area to divert the irrigation water to the area. The weir would be 4.5 m high and 35 m long including the scouring sluice portion. In the right end of the weir, a scouring sluice with 2 sets of gate, 2.0 m wide and 2.0 m high, would be provided so that the deposited sand can be flashed down. The scouring gate would be operated by man power. An intake structure would be constructed on the right bank. The intake gates would consist of 3 sets of slide gate, each 2.0 m wide and 1.8 m high, which would be operated by man power. The intake discharge is estimated at 7.4 m^3 /sec at maximum.

The layout of proposed intake weir is shown in Fig. VII-7.

5.2.2 Irrigation canal system

(1) Layout planning of irrigation canal

A layout planning of irrigation canal is made on the topographic map on a scale of 1/50,000. The topographic map on a scale of 1/10,000 prepared by RID is used for this work. In the planning the following matters are taken into consideration.

(a) Canal alignment should be straight and short as much as possible.

(b) The existing irrigation canals are to be incorporated to the project canal system as much as possible.

(c) Embankment portion should be minimized as much as possible.

The layout of irrigation canal system is shown in Fig. VII-8.

(2) Design of irrigation canal

Design discharge

Based on the unit irrigation water requirement of 1.0 l/sec/h the design discharges for the irrigation canals over the model area are calculated as shown in Fig. VII-9.

Linning of canal

All the main canals and laterals are lined with 10 cm thick plain concrete to protect seepage from the canal bank and bottom and the canal section against erosion.

Velocity

The maximum permissible velocity of concrete lined canals are determined at 1.5 m/sec. The minimum permissible velocity is determined at 0.5 m/sec so as not to induce the growth of aquantic plants and to deposit the sediments.

Roughness coefficient

The Manning formula is used for determination of hydraulic properties of canals. The Manning's roughness coefficient "n" is assumed at 0.015.

Freeboard and west bank

Freeboard is decided so as to absorb the fluctuation of water level due to the variation of actual roughness coefficient, conversion of velocity head to the statistic head and wave action caused by wind or regulating structure operation. The minimum freeboard is determined as follows:

Discharge (m ³ /sec)	Minimum Freeboard (m)
Less than 2.0	0.15
2.0 - 7.0	0.20

The height of waste bank is determined to be 0.3 to 0.4 m for concrete lined canal.

Canal base width/water depth (B/h) ratio

The ratio of canal base width and water depth is determined as follows:

- Concrete lined canal

$\frac{B/h}{1.0 - 2.0}$

Side slope

The side slope of canals is assumed at 1:1.5.

Considering above design criteria, the preliminary designs of main canal and lateral for the model area are made. The profile of main canal is shown in Fig. VII-10. The typical cross section of irrigation canal is shown in Fig. VII-11.

(2) Design of related structures

Many different types of canal structures are required in the irrigation canal system of model area to effectively and efficiently convey and regulate the irrigation water. The following canal structures are envisaged to be constructed for the model area.

Turnouts with check

These structures would be provided to divert water from the main canal or lateral to lateral or sub-lateral. The check would be provided to regulate the canal water surface upstream of the structure and control the downstream flow. The structure would comprise a reinforced concrete flume and transition with gradually varied section at both up- and downstream of the flume. The flume would be equipped with steel slide gate to regulate water surface in the canal.

Syphon

The main canal would cross over the many existing streams. The syphon structures would be provided at such crossing places. The structure would consist of inlet transition, cast-in-place concrete conduit with rectangular section and outlet transition.

Culvert

Culvert would be provided to convey irrigation water under roads. The culvert would consist of a rectangular reinforced conduit or a precast concrete pile and transition with gradually varied section at inlet and outlet of the conduit.

Sidespillway

The sidespillway would be provided to waste excessive water which may result from misoperation, heavy rainfall or floods caused by break of canal embankment. For the purpose mentioned above, the sidespillway would be constructed upstream of syphon structures.

5.2.3 Design of drainage canal system

(1) Layout planning of drainage canal

There exist many existing small rivers and streams. These rivers and streams would be used for drainage purpose as much as possible. Only collector drain would be provided in the model area so as to drain the excess water of rainfall to the existing rivers and streams. (See Fig. VII-8)

(2) Design of drainage canal and its related structures

According to the drainage water requirement estimated in Section 4.2, the unit design discharge is determined at 3.67 l/sec/ha. Design discharge of respective drainage canals are calculated on the basis of the unit design discharge.

The related structures to the drainage canals include corss drains and culverts. They are planned and designed with the same principles as those of the related structures for irrigation canals.

The typical cross section of drainage canal is shown in Fig. VII-11.

5.2.4 Inspection road

For proper operation and maintenance of project facilities, well arranged inspection roads are of vital importance.

(1) Main inspection road

The main inspection roads are required for inspection, operation and maintenance of main canals. Considering the future increase of vehicles for the inspection and operation and heavy construction to be required for the canal maintenance and repair, all the main inspection roads are so designed as to have an effective width of 5 m and to be laterite-paved. These roads are also used for transportation of agricultural products and equipment.

(2) Lateral inspection road

The lateral inspection road is mainly provided alongside the lateral canal. All these roads have a width of 4 m.

The typical cross section of inspection road is shown in Fig. VII-11.

5.3 Layout Planning of Canal System for High Priority Projects

A layout planning of canal systems for the high priority projects in made by using the topographic maps on a scale of 1/50,000. The layout is shown in Fig. VII-12.

to be rehavilitated Condition Existing Useless 6000 Good Good Construction 1970 - 1982 - 1977 - 1977 1950 - 1954 1975 - 1976 - 1982 Year 1975 1975 1980 EXISTING LARGE AND MEDIUM SCALE IRRIGATION PROJECT radial gate 6.0m×11.5m×3 1.5mxl.5mx2 at both bank = 37.9 km right bank 2.0mxl.75mx2 = 45.8 km left bank 1.5mxl.5mxl Max Capacity 430 m³/sec Weir and intakes were deteriorated L = 60 m, H = 3.0 m2.5 m Main Features of Facilities L = 366 m, H = 11.0 m, lateral r-d 3,700 x 10³ m³ lt main 4 m x 3 m x × н 6 m x 3 m T.W=8.0m m L = 18m, ¢1.0m × Irrigation System •• Radial Gate Radial Gate Reservoir: Spillway : Earth Dam: Intake Intake Intake Weir Weir Trrigation Area (rai) 7,500 88,000 55,000 10,000 12,500 105,000 Existing Medium Scale Irrigation Project Existing Large Scale Irrigation Project Table VII-1 Khun Lard Boriban (R.G.) Khlong Nam Hom Wang Rom Klao Wang Khun Pao Sakae Krang River Project Name Khlong Pho River Thap Salao River Khlong Yang Thap Salao Mae Wong River Thap Salao 2 ÷ , , .III. . HT .νı н

VII-18

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(1/3)	•
PROJECT	
E IRRIGATION PROJ	
SCALE	BASIN
SMALL	RIVER I
Y LIST OF EXISTING SMALL SCALE	IN SAKAEKRANG RIVER BASIN
: Й	SAF
LIST	NH
INVENTORY	,

Table VII-2

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ruc-	t p	ଳ	ч. 	41	100	79	89	54	00	.221	30	65				17	.66	33	85	80	69	40	EL3	121	53	75	65		
- Construc		00(100	· · ·			0-0 	2.4	ື ຕ	2.6	5-H	2.1	e e				3.4		. •	. •	•)6 °0	•		. •	•	•			
Construc	tion Year		· · · ·	1984	1982	1984	1977	1982	1982	1983	1981	1984				1984	1984	1984	1982	1982	1983	1981	1980	1981	1983	1983	1983		i et :
Irrigation Construc-	System			Yes	NO	Yes	Yes	NO	Yes	Yes	Yes	No				Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NO	Yes	No	Yes		
Structure	Regulator Right Bank			2 - ¢1.0m	2 - ¢1.0m	1		Ĩ,	2 - ¢l.om		- 2.0m x 2.0m	1 - ¢1.0m				ю 1	ф 	I - ¢1.0m	⊕ 		U	1	2 - ¢1.0m		1 - ¢1.0m	1	3 - ¢1.0m		
eature of	Head R Left Bank				1 - ¢0.3m	1	2 - ¢1.0m		1	1	2 - ¢1.0m 1	1 - ¢1.0m				1	T	1 - ¢1.0m		- 41.	· •	- ¢1.	τφ	•	1 - ¢1.0m	· · í ·	1		
Main F	Works Height	(m)			2.5		m	Μ	2	ч Ч		2.25	:			2.75	m	4	-1	2	1.8		•	•	2.5		1 #1		
	Head Length	(m)		I.	ŝ	392	25	40	25	с Т	14	12		जि		50	20	152.5	12	16	10	24	25	35	17.5	20	57		ดิเ
Irrigation	Area	(rai)		3,000	10,000	3,000	26,000	200	4,000	4,000	10,000	300	60,500	(9,680 ha		4,000	4,000	4,300	5,000	1,500	6,000	6,000	7,500	4,000	2,500	8,000	1,000	· •	000 8
	Project Name		e Wang River	. Ban Wang Nam Kao (RG)	. Khlong Saingu (RE)	. Huai Hin Lab (RE)	. Wang Ma (W)	. Sawang A-ROM (W)	. Lan Bai Dieo (W)	. Nong Yao (W)	. Wang Hin Phoeng (W)	. Huai Pra Khun	Total		Khlong Pho River	. Bank Hua Khao Daeng (W)	. Khlong Pho (RG)	. Ban Khlong Khoi (W)	. Thung Mon (W)	. Wang Hin (W)	. Huai Yai Hen (W)	. Map Kae (W)	. Khao Kwang Thong (W)		. Ban Wang Ta Kien (W)	•	Nong Kwan Koob (W)	Total	
			I. Mae	1	2.	м	ধ	ທ ທ	0	7.	ö	б	V	/11-	н П	H	8	'n	4	ທີ່		~	ο	ົດ	P P	11.	12		

INVENTORY LIST OF EXISTING SMALL SCALE IRRIGATION PROJECT (2/3) IN SAKAEKRANG RIVER VASIN

Table VII-2

1.									1.1	
•		•	Irrigation	-	Main Fé	Feature of St	or Structure	Irrigation Construc-	·	Construc-
		Droiert Name	A Y GA	Heas W	Works	Head	Head Regulator	Stretom	tion	tion
			S S S S	Length Height	Height	Left Bank	Right Bank	11))) (X	Year	Cost
	· .		(rai)	(m)	(m)					(10°))
Ч	LI. Thap	o Salao River			1.				·· .	
						•		•	· · ·	
		Pak Muang (RG)	3,500		ŀ	2 - 01.0m		Yes	1981	LΩ.
	5	Takro (RG)	10,000	I	∩i 		50m ~	Yes	1981	0.728
		Lak Met (RG)	21,500	'n,	1	1	3-1.0m×1.75m	Yes	1981	0.957
	4	Khong Chai (W)	4,000	65	л . 1	- Q L	I 	Yes	1981	2.106
	ى. ك	Ban Bo Mad (W)	2,000	12	1.7	1 - ¢1.0m	1 - ¢1.0m	Yes	1984	0.885
т. т .	v	Nong Ban (W)	3,000.	12 5	1.65	1	1 - ф1.От	NO	1984	1.005
	7	Huai Wi (W)	3,000	15	л-5			No	1984	1.576
'n	ω.	Ban Mok Thaeo (W)	1,000	15	1.75	. 1	ł	NO	1981	1.330
	б	Don Kloi (W)	5,000	ი	Ъ. 5	ł	ł	NO	1980	0.633
	10.	Nong Phangkha (W)	5,000	н г	1.25	1		NO	1980	0.633
	, 11.	Tha Pho (W)	1,000	т т	1.25	1	ť	No	1981	1.298
	12.	Ban Sup Pra Kon (RG)	500	Ì	. 1	1 - ¢1.0m	1	Yes	1984	0.216
	13.	Huai Pra Chan (W)	3,000	7	0.6	ı	ſ	NO	1983	0.193
,	14.	Ban Kao Hin Chon (RG)	2,000	ŧ.	I	I	3 - 1.50m x 1.50m	m Yes	1983	1.121
	15.	Huai Rob (RG)	2,000	1	1	2 - ¢1.0m	4 - ¢1.0m	Yes	1984	0.875
		Total	66,600				÷	•		
			(10,640 ha	. (1						
				`ı						

VII-20

INVENTORY LIST OF EXISTING SMALL SCALE IRRIGATION PORJECT (3/3) IN SAKAEKRANG RIVER VASIN

Table VII-2

Construc-(10⁶ B) .334 3.782 L.643 0.352 1.740 1.768 3.710 tion Cost ..038 L. 385 3.782 2.400 1.526 1.471 1.331 Irrigation Construction Year 1979 1983 1984 1983 1984 1984 1984 1984 [98] 1984 1981 1981 1981 1981 System Yes. Yes Yes Yes Yes Yes Yes Yes X @S Yes 0N N 0 Z Right Bank 3 - ¢1.0m 2 - ¢0.8m 1 - ¢I:0m 2'- ¢0.8m $1 - \phi 1.0m$ 2 - ¢1.0m 2 - ¢0.8m - 41.0m Head Regulator Main Feature of Structure 2 - 1.0m x 0.8m Left Bank $2 - \phi 0.8m$ φl.Om 2 - \$1.0m 1 - ¢1.0m 1 - ¢0.8m 1 - ¢1.0m 1 - \$1.0m - ¢1.0m Length Height 2.64 Head Works 0 1 1 0 5 1 5 0 ю. Н <u>я</u> 0.5 2.5 2.5 1.5 ດ ത 7 24.9 12 30 (iii) Irrigation 1,500 4,500 4,000 10,000 25,000 2,000 4,000 6,000 2,000 800 300 3,000 75,800 10,000 Area (rer) Ban Khlong Wai (RE Huai Khun Xaew (W) Ban Nong Kae (RG) Wang Nam Khao (W) Kao Chong Lom (W) Ban Hin Ngun (W) Dong Prai (RG) Kao Ta Nod (W) Pong Khoi (W) Huai Luk (RE) Project Name Norachon (W) Khok Khwai River Total I Toob (W) Bo Luk (W) Huai Khot Ц. 12 13. 0 14. 4 0 ი ~ ហ ω す Ø τv.

12,130 ha)

VII-21

Nov 00t Se D S C Aug Jul Jun Nakhom Sawan Station May Apr Mar Fеb Jan Unit °C & mbar mabr mabr

POTENTIAL EVAPOTRANSPIRATION

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Table VII-4

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IRRIGATION WATER REQUIREMENTS FOR PRESENT CONDITION, IRRIGATED FIELD (1/2)

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0.699 0.598 0.462 1.018 0.873 0.074 0.328 0.227 0.046 0. 0.112 0.094 0.462 1.018 0.141 0.012 0.028 0.036 0.007 0.

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1954 CROP SEASON

COMBINED VATER REQUIREMENT (MA) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT VATER REQUIREMENT (L/SEC/RAI) 1955 CROP SEASON

CONBINED VATER REQUIREMENT. (MA) UNIT VATER REQUIREMENT. (L/SEC/MA) UNIT VATER REQUIREMENT (L/SEC/MAI)

CONDINED VATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/HAI)

1957 CROP SEASON

1956 CROP SEASON

CONDINED VATER REQUIREMENT (P.N.) UNIT MATER REQUIREMENT (L/SEC/NA) UNIT MATER REQUIREMENT (L/SEC/NA))

1958 CROP SEASON

CONSINED WATER REQUIREMENT. (88) UNET WATER REQUIREMENT (LISECINA) UNIT WATER REQUIREMENT (LISECIRAL)

1959 CROP SEASON

COMBINED WATER REQUIREMENT (HH) UNIT WATER REQUIREMENT (LISECINA) UNIT WATER REQUIREMENT (LISECIRAL)

1960 CROP SEASON

CONDINED WATER REQUIREMENT UNIT WATER REQUIREMENT (LISECINA) UNIT WATER REQUIREMENT (LISECIRAL)

1961 CROP SEASON

COMBINED WATER REQUIREMENT (NA) UNIT WATER REQUIRENENT (L/SEC/NA) UNIT WATER REQUIREMENT (L/SEC/RAI)

1962 CROP SEASON

COMBINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (LISECIMA) UNIT WATER REQUIREMENT (LISECIMAT)

1963 CROP SEASON

COMOLNED WATER REGULREMENT (1MM) UNIT WATER REGULREMENT (L/SEC/HA) UNIT WATER REGULREMENT (L/SEC/HA)

1964 CROP SEASON

COMBINED VAICE REGULARMENT (MM) UNIT VATER REGULARMENT (LISECINA) UNIT VATER REGULARMENT (LISECINA)

1965 CROP SEASON

COMBINED WATCH REQUIREPENT (TM) UNIT WATER REQUIREMENT (L/SEC/NA) UNIT WATER REQUIREMENT (L/SEC/RAI) 1966 CROP SEASON

COMULINED VATER REQUIREMENT (MM) UNIT VATER REQUIREMENT (LISEC/IIA) UNIT VATER REQUIREMENT (LISEC/RAL)

1967 CROF SEASON CONDINED WATER REQUIREMENT (MM) UNIT VATER REQUIREMENT (L/SEC/HA) UNIT VATER REQUIREMENT (L/SEC/RAT)

1968 CROP SEASON OMBINED WATER REQUIREMENT

UNIT WATER REQUIREMENT (LISECINA) UNIT WATER REQUIREMENT (LISECINAL) 1969 CROP SEASON

CONBINED WATER REQUIREPENT (MN) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/RA1) 1970 CROP SEASON

COMBINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (L/SEC/MA) UNIT WATER REQUIREMENT (L/SEC/RAI)

1971 CROP SEASON COMBINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (L/SEC/MA) UNIT WATER REQUIREMENT (L/SEC/PAI)

1972 CROP SEASON

CONDINED WATER REQUIREMENT (HM). UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/RAT)

1973 CROP SEASON COMBINED VATER REQUIREMENT (L/SEC/HA) UNET WATER REQUIREMENT (LISEC/RAT)

124. 20. 88. 49. 20. 0.477 0.074 0.328 0.201 0.074 0. 0.076 0.012 0.032 0.032 0.012 0. 124. 293. 102. Û. 0. 0.074 0.085 0.063 0.175 ń. **J**ÅH лан JUL AUG SEP 130 NOV 330 I EB HAR APR *** 164. 161. 102. 216. 216. 20. 88. 51. 13. n.612 0.599 0.394 0.808 0.834 0.074 0.328 0.209 0.048 0. 0.098 0.096 0.061 0.129 0.133 0.012 0.052 0.034 0.008 0. ٥. 0, ٥. -J DÉM JÓL 4116 SEP 001 ROV 330 JAN FEA HAR APR 847 215. 154. 102. 205. 252. 20. 80. 45. 23. n.795 9.593 0.394 0.784 0.895 0.074 0.297 0.186 0.088 0. n.127 n.075 0.063 0.123 0.143 0.012 0.046 0.030 0.014 0. ٥. ő, AUG SEP 061. NOV DEC JAN FEB NAR APR ามห JUL 841 152. 275. 102. 277. 232. 29. 88. 50. 20. 0.566 0.765 0.394 1.041 0.595 0.074 0.328 0.208 0.076 0. 0.491 0.122 9.063 0.167 0.143 0.012 0.052 0.033 0.012 0. Ĉ. Ô. ο. ٥. JÚĹ AUG SEP 0°E T NOV DEC JAN FEB NAR 1111 RAY

51 154. 244. 102. 254. 205. 20. 88. 51. 21. 1575 0.719 0.394 0.950 0.791 0.074 0.328 0.212 0.077 0. ο. Π. ۵. 0.092 0.147 0.063 0.152 0.127 0.012 0.052 0.034 0.012 0. ο. AN OFC TER 100 JUL AUG SEP 001 NOV MAR HAY 203. 148. 20. 88. 49. 20. 0.756 0.570 0.974 0.328 0.204 0.075 0. 0.121 0.091 0.012 0.052 0.033 0.012 0. 101. è. 124. 137. 0. ο. 0.462 0.512 0.418 ٥.

DEC JAN. FEB NAR FUG. SÉP กตั้ง NOV 881 JUC JUN 142, 214, 164, 203, 212, 20, 88, 55, 23, 0.51 9.715 0.634 6.758 0.295 0.674 0.328 0.227 0.086 0. 0.100 0.130 0.101 0.121 0.143 0.012 0.035 0.036 0.014 0. ó. σ. в. 0. ٥. 108 au c ÖCT NOV JAN FEB APR RAT JUL 211. 232. 20. 88. 55. 23. 0.770 0.895 0.074 0.328 0.227 0.086 0. 255. \$7.9 102 Ô. Ο. с. 0.750 0.666 0.394 0.770 0.895 0.074 0.328 0.227 0.086 0. 0.152 0.107 0.063 0.126 0.143 0.012 0.052 0.036 0.014 0. ο. 0. JAN FEB APR ากท AUG 510 001 NOV DEC HAR НАТ ាព

192, 177, 108, 232, 106, 20, 88, 51, 21, 0.718 0.661 0.418 0.266 0.418 0.074 0.328 0.211 0.080 0. 1.115 0.306 0.067 0.137 0.067 0.012 0.052 0.034 0.013 0. ٥. Ũ. ò. 0.115 0.106 0.067 ο. TER A [* 8 MAT JAN สแก 101 410 ser OÈ E NAV 114

124, 220, 102, 220, 218, 17, 18, 49, 15, n, 662 n, 521 0, 394 0, 721 0, 862 n, 665 0, 328 0, 203 0, 057 0, n, 74 6, 131 0, 663 0, 131 0, 155 0, 010 0, 657 0, 033 0, 809 0. с. Ο. ú. 0. 0. 1. 2 ٥. **HAR** APS ** 11.44 FER 001 ŃÓV DEC ine JH 486 SEP 242, 1/2, 102, 251, 215, 1*, 59, 48, 18, 0.703 0.603 0.394 0.950 0.231 0.069 0.220 0.199 0.068 0. 0.144 0.097 0.061 0.152 0.133 0.011 0.035 0.032 0.011 0. ٥. ŧ. ٥. ٥.

٥. DEC-JAN FER NÀA AP \$ RAT 101 JUL ៖មផ SEP 130 .804 205, 137, 157, 203, 178, 19, 88, 55, 23, n.764 0.512 0.606 0.756 0.686 0.072 0.328 0.227 0.086 0. 0.122 0.062 0.097 0.121 0.110 0.012 0.052 0.036 0.014 0. θ. ٥. θ. ο. FEB 541 NEC JAN HAR APR JUN JHL AUG SEP 001 ΧQΛ 169, 221, 102, 203, 192, 20, 88, 54, 17, 0,429 0,724 0,394 1,957 0,743 0,074 0,325 0,225 0,083 0, 0,101 0,132 0,065 0,169 0,119 0,012 0,057 0,036 0,010 0, Û. 0. ġ. DEC JÀĤ FEB MAR AP 9 RAT HOV SFP 061 204 100 AUG n. 147 21 20. 84. 55. 221. 166. 265 227. υ. 0.078 ٥. 6 0 290 n. Ð 0.

0.424 0.527 U.631 0.100 0.132 0.101 .012 0.050 0.036 0.158 0.142 ò 0.012 0. 344 APR HAT 001 HOV DEC IEB MAR SEP JUN ંગમ 70 G 155, 537, 102, 265, 219, 20, 87, 52, 13, 0,578 1,252 0,394 0,985 0,846 0,074 0,324 0,214 0,050 0, 0,092 0,201 0,065 0,157 0,135 0,012 0,052 0,034 0,008 0, Ū. Ω. 0. 0. 'n. ٥, 7141 101 SEP DC T KOV DEC JAN FEB MAR 128 JUH 22. 0.580.0 ٥. 79. 48. о. 180. 182. 147, 232 209 ٥. ۵. 0.867 0.804 0.068 0.681 0.566 Ô. **0**. ά. 0.107 0.109 0.091 P.139 0.129 0.011 0.067 0.032 0.013 0. RAT JAN FEN HAR APS AUG SEP 001 NOV 100 309 161. 145. 138. 235. 232. 19. 88. 54. 23. 0.501 0.543 0.455 C.879 0.895 0.072 0.328 0.221 0.085 0.096 0.987 0.073 0.143 0.011 0.052 0.035 0.014 Q. ю. ٥. 0. ٥. n. õ 0.

0.096 0 RAT AUG 001 HOV DEC 112.0 TER MAR 106 JUE 165. 147. 102. 204. 99. 16. 85. 55. 20. 0.615.0.550 0.394 0.761 0.346 0.061 0.328 0.226 0.075 0. 0.098 0.988 0.063 0.122 0.055 0.010 0.032 0.038 0.012 0. е. ٥. õ. Ô. ٥. ŏ. ИАТ TER APR PFC 114 HAR **≜**₩6 SEP 601 HOY JUN JUL Π. 0.

205. 205. 102. 323. 174. 20. 88. 50. 22. 0.759 0.767 0.394 1.207 0.670 0.074 0.328 0.205 0.084 0. 0.121 0.125 0.065 0.193 0.107 0.012 0.052 0.033 0.013 0. 0. n.

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Table VII-4 IRRIGATION WATER REQUIREMENT FOR PRESENT CONDITION, IRRIGATED FIELD (2/2)

1974 CROP SEASUR

CONVINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (LISECIMA) UNIT WATER REQUIREMENT (LISECIMA) 1975 CROP SEASON

COMBINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/HA))

1976 CROP STASON CONDINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (LISECINA) UNIT WATER REQUIREMENT (LISECIRAT)

1977 CROP SEASON

COMBINED WATER REQUIREMENT (PH) UNIT WATER REQUIREMENT (LISTC/HA) UNIT WATER REQUIREMENT (LISTC/HA)

1979 CROP SEASON

COMBINED WATER REGULREMENT (MM) UNIT WATER REGULREMENT (L/SEC/IIA) UNIT WATER REGULREMENT (L/SEC/RAI)

1980 CROP SEASON COMBINED WATER REQUIREMENT (PH) UNIT. WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/HAI)

1981 CROP SEASON

COMBINED VAILS REGUIRENENT (11M) Unit vails requirement (1/S(C/DA) Unit vails requirement (1/S(C/DA))

102 101 AUG SEP 661 . HOV D'É C JAN FER HAR 448 KA1

172. 203. 102. 203. 162. 19. 49. 52. 16. 0.441 0.759 U. 94 0.756 0.523 0.070 0.183 0.216 0.658 0. 0.103 0.121 0.663 0.121 U. 100 0.011 0.029 0.035 0.009 0. υ. n O ο. ٥. NOV JUN JUL & ANG SEP 001 239 JAN FER MAR AP8 NAY 174. 185. 149. 245. 88. 18. 85. 54. 13. C.550 9.691 9.575 0.915 0.338 0.068 0.328 0.223 0.048 0. P.104 0.111 0.092 C.144 9.054 0.011 0.052 0.038 0.008 0. 6 ٥. ٥. £. ٥, η, 0. JUN JUL AUG SEP 1 30 NOV DEC. JAN FEB HAR APR . NAY 6. ٥,

193. 137. 116. 206. 170. 20. 88. 55. 23. 5.719 0.512 0.449 0.769 0.654 0.974 0.328 0.727 0.086 0. 0.115 0.622 9.972 (.123 0.105 0.012 0.052 0.036 0.014 0. n 0 ٥. Ο. aun JUL AUG \$£₽ . 001. NØV DEC 1411 TEB MAR 1P\$ NAY 1, 203, 140, 113, 302, 232, 18, 87, 45, 23, n,004 n,758 n,522 0,434 1,128 n,895 n,067 0,326 0,184 0,085 0, n,001 n,121 9,684 0,669 n,181 0,143 0,011 0,052 0,030 0,014 0, θ. Π. ŏ. 1978 CROP SEASON ាណ JUL AUG 5EP 100 NOV NEČ 🗇 JAH f E B HAR APR **83 Y** COMBINED WATER REQUIREMENT (114) UNIT WATER REQUIREMENT (L/SLC/114) UNIT WATER REQUIREMENT (L/SEC/PAT) 124, 205, 109, 277, 232, 20, 56, 47, 23, 0,402 9,760 9,421 1,053 0,895 0.074 0,328 0,195 0,086 0, 0,574 9,123 0,067 0,165 0,143 0,012 0.052 0,031 0,014 0. ь. ٥. 0. ٥. ο. ő. Ο.

> JUN JUL + UT SEP N0 V DEC 144 FER HAR APR MAY 175. 174. 192. 399. 212. 20. 88. 53. 20. n.457 n.447 0.394 1.455 n.975 n.774 0.327 n.220 0.074 0. n.104 n.114 0.065 n.733 n.143 n.012 0.057 0.035 0.012 0. ΰ. ٥. Ο, ο. ο. ۰. Ο. SEP 130 or c JAN 118 1011 101 496 NDV-MAR APR MAY 141. 116. 203. 105. 20. 28. 43. 21. 0.601 0.447 0.756 0.407 0.674 0.328 0.178 0.079 0. 0.494 0.071 0.121 0.065 0.012 0.952 9.029 0.013 0. 162. P.605 161. 116. в. 0. я. 0.397 ο. **FIGN** JUL AUC SEP 001 HOY 134 1411 CEG . MAR AFR MAT

> > o. 0. 0. 151. 200. 125. 235. 55. 29. 88. 53. 23. 0.502 n.747 9.483 0.276 0.211 0.074 0.328 0.721 0.086 0. 0.070 0.110 0.077 0.149 0.036 0.912 0.052 0.035 0.014 0. Ο, р. г. ٥.

Table VII-5 IRRIGATION WATER REQUIREMENT FOR PRESENT CONDITION, SEMI-IRRIGATED FIELD (1/2)

としては、ちゃうかりていていた はっていたいが	New York Comp	te parti	1.1		a (1997) 1997	1.56		- 1, S	1				
1954 CROP SÉASON		JUL	AUG	580	001	NOV	DEC	JAI	C S	FEB	NAR	 AP	R NAY
COMBINED WATER REQUIREMENT (#*)		100.	101.	101	275	330.	125.		÷	٥.	0.	0	
	0	.0.374	-0.376	0.397	1.028	1.271	.0.478	0.	· 0.		. 0.	-0	
UNIT WATER REQUIREMENT (L/SEC/RAI)		سلينيكرهم	سريا أخضم	جد اجرح العب		يترا شيته جاره		tyrt f.	. Q e		0.	¢.	0.
1955 CROP SEASON	ĴŬŔ	101	AUG	SEP.	0¢1	NOV	DEC			FEB		× AP	R MAY
COMBINED WATER REQUIREMENT (MM) Junit Mater Reduirement (L/SEC/HA)	0.	30, .0.112	75. 0.280	82.	295	192.	128.	0.01	Ó.	٥.	0.	0	• <u>0</u> •
UNIT WATER REQUIREMENT (LISEC/RAL)	C.	0.018	0.045	0.050	C+176	0.119	0.077	0.	ŏ.	-	0.	0.	Ο.
1956 CROP SEASON	XU S	JUL	AUG	SEP	001	NOV	0EC	IAL .	i - [FEB	MAR	AP	R MAY
COMBINED WATER REQUIREMENT (MA)	0.	74.	101.	82.	219.	316.	128.	0.	ىدىيەت. بارىغان	0.	0.	0	0,
COMBINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/RAI)	·····0. ·····	0.278	D.379	0.315	0.817	1.218	04478	0	0.	-4-	Ď	. 0	
a a sector a sector de la construcción de la construcción de la construcción de la construcción de la construcc	dia mangana kana kanalana		تبرج حاتج سائم	للمها ليرسخ للمس		الراسيسين	الالتخاليين وسو	0115.	6 B S	1.5		ليتعددون	0.
1957 CROP SEASON	NUL	JUL	AUG	SEP	110	NOV	DEC	141	من ا	F E B	HAR	ÂP	8 MAY
COMBINED WATER REQUIREMENT (MM) UNLT VATER REQUIREMENT (L/SEC/HA)		179.				337.		0.0	n.	0.	0. 0.	0	
UNIT WATER REQUIREMENT (L/SEC/RAL)	0.	0.077	0.059	0.050	0.124	6.202	0.077	0.	0		0.	0.	Da 0,
1958 CROP SEASON	JUN	JUL	AUG	SEP	0C T	NOV	DEC	jai	i sta L	FEB	HAR	AP	8 8AT
COMBINED WATER REQUIREMENT (MM)	<i>b</i> .	61.	164.	62.	281.	337.	128.	0.	÷	Q.	0.	0	0.
CONBINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (L/SEC/MA) UNIT WATER REQUIREMENT (L/SEC/MAI)		125.0	0.61	0.315	1-051	1 301	0.478	0.	C. 0.		D. 0.	0	
									с. с. 4 с. с.				0.
1959 CROP SEASON	JUN	JUL	AUG	SEP	001	NOV	DEC	JAL	·	FEB	HÁR	API	R HAY
COMBINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (LYSEC7HA)	0.	63.	222,	82.	257.	301.	128.	0	۵.		0. 0.	. 0. n	0.
UNIT WATER REQUIREMENT (L/SEC/RAI)									0	- 1177) 	0.	0 0.	_0. .0.
1960 CROP SEASON	RUF	JUL	AUG	SEP	0CT	NOV	DEC	JAN	i ji i	EB.	MAR	API	RAY
CONBINED WATER REQUIREMENT, (MM)	0.	30.	¢8.	89.	205 -	224	128-	0.	en.	٥,	0.	. 0	0.
UNIT VATER REQUIREMENT (L/SEC/HA) UNIT VATER REQUIREMENT (L/SEC/RAI)	0.	0.112	0.255	0.345	0.766	0.865	0.476	0.	0.	2.	ù. 0.	. 0 a	
	·		· · · · · · · · · · · · · · · · · · ·						· 1			• 0 •	0.
1961 CROP SEASON	3UN	JUL	AUG	582	130	KOA	DEC	JAN		EB	MAR	API	е мат
COMBINED WATER REQUIREMENT (MM)	0.	95.	182.	156.	206.	337,	128.	o. ⁰ .	η.	٥.	0.	0	. 0.
UNIT VATER REQUIREMENT (L/SEC/HA) UNIT VATER REQUIREMENT (L/SEC/RAI)	0.	0.057	0.109	0.096	0.123	C-208	0.077	0.	0		0.	0.	0,
1962 CROP SEASON	NUL	JUL.	AUG	SEP	oc r	NOV	DEC		5 - 1	EB	MAR	API	- RAY
CONDINED WATER REQUIREMENT (MM)	0.	\$77.	127.	87.	211.	337.	\$28-				Ū.	0	0.
UNIT WATER REQUIREMENT (L/SEC/HA)	D +	0.643	0.(22.	0.315	0.299	1.301	0.478	0	0.		.0		
UNIT WATER REQUIREMENT (L/SEC/RAI)				وبر بد المستحدة			للمشيعهم	inites of the		·	0,	0.	0.
1963 CROP SEASON	JUN	JUL	AUG	SEP	001	40V	DEC	JAA		FEB	MAR	API	т явт
COMBINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (L/SEC/MA)	0.	106.	125.			172			Ó.	0.	0.	0	
UNIT WATER REQUIREPENT (L/SEC/RAI)	0.	0.963	0.074	0.055	0,140	0.106	0.077	0.	Ŭ.	•	0.	0.	D 0.
1964 CROP SEASON	JUN	JÜL	AUG	SEP	0C T	NOV	DEC	JA	x .	FEB	BAR	AP	R MAT
COMBINED WATER REQUIREMENT (MM)	0.	30.	125.	82.	222	319.	117.	0		0.	0.	0	÷ 0.
UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/RAI)		0-112	0.672	0.315	0.230	1.230	0.436	0.	ο.	0.55	0	-0	
							i.	i	0.	1.5	0.	0.	0.
						· · · · · · · · · · · · · · · · · · ·							
1965 CROP SEASON	JUK				007	NOV	130	JA	,		FA 8	AP	
COMBINED WATER REQUIREMENT (MM)	0.	161.	103.	82.	257	315.	122.	0		0.	0.	0	. 0.
	0. 0.	161. D.600	103.	82. 0.315	257 C.960	315.	122.	0.0		0.	0.	0	
COPOINED WATER REQUIREMENT (PM) UNIT WATER REQUIREMENT (L/SEC/HA)	0. 0.	161. D.600 0.096	103. .0.384	82. 0.315	257. £.960 0.154	315. 1.215 0.194	122.	0. 0.	0. Q.	0.	0. 0.	0.	• 0. -0
CONGINED WAIER REQUIREMENT (PM) UNIT WAIER REQUIREMENT (L/SEC/NA) UNIT WAIER REQUIREMENT (L/SEC/RAI)	0. 0. JUk 0.	161. D.600 0.096 JUL 119.	103. 0.384 0.061 AUG 68.	82. 0.315 0.050 SEP	257. £.960 0.154 0C1 205.	315. 1.215 0.194 xov 265.	122. 0.455 0.073 DEC 126.	0. 0, 3A1	0. 0.	0.	0. 0.	0 0. 0. AP	• 0. -0. -0. -0. -
COMBINED WATER REQUIREMENT (PM) INIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/RAT) 1966 CROP SEASON COMBINED WATER REQUIREMENT (PM)	0. 8. 9. JUk 0.	161. D.600 0.096 JUL 119.	103. 0.384 0.061 AUG 68.	82. 0.315 0.950 SEP 147.	257. £.960 0.154 00154 001	315. 1.215 0.194 Nov 265.	122. 0.455 0.073 DEC 126.	0. 0. 3A:	0.	0. FEB	0. 0. Răr	0 0 0 0	• 0. 0. 0. R MAT
COMBINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/RAI) 1966 CROP SEASON COMBINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/RAI)	0. 8. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9. 9.	161. D.600 0.096 JUL 119. 0.446 0.071	103. 0.384 0.061 AUG 68. 0.255 0.041	82. 0.315 0.950 SEP 147. 9.568 0.091	257. C.960 0.154 0C1 205. 0.766 0.123	315. 1.215 0.194 xov 265. 1.021 0.163	122. 0.455 0.073 DEC 126. 0.470 0.075	0. 0, 3A: 0. 0.	0. 0. 0.	0.	0. 0. PAR 0. 0.	0 0 0 0 0 0	• 0. 0. 8 MAT • 0. 0.
COMBINED WATER REQUIREMENT (PM) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/RAT) 1966 CROP SEASON COMBINED WATER REQUIREMENT (PM) DATI WATER REQUIREMENT (L/SEC/RAT) UNIT WATER REQUIREMENT (L/SEC/RAT) 1967 CROP SEASON	0. 0. JUk 0. 0. 0. 0. Uk	161. D.600 0.096 JUL 119. 0.446 0.071 JUL	103. 0.384 0.061 AUG 68. 0.255 0.041 AUG	82. 0.315 0.050 SEP 147. 0.568 0.091 SEP	257. C.960 0.154 0C1 205. 0.766 0.123 0C1	315. 1.215 0.194 Nov 265. 1.021 0.163 HOV	122. 0.455 0.073 DEE 126. 0.470 0.075 DEC	0. 0, 3A 0. 0. 0.	0.0.	0. FEB 0.	0. 0. 0. 0. 0. 0. 0. 0.	0 0 0 0 0 0 0 0 0	• 0. 0. 0. R MAT • 0. 0. 0. R MAT
COMBINED WATER REQUIREMENT (PM) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/RAT) 1966 CROP SEASON COMBINED WATER REQUIREMENT (PM) DATI WATER REQUIREMENT (L/SEC/RAT) UNIT WATER REQUIREMENT (L/SEC/RAT) 1967 CROP SEASON	0. 0. JUk 0. 0. 0. 0. Uk	161. D.600 0.096 JUL 119. 0.446 0.071 JUL	103. 0.384 0.061 AUG 68. 0.255 0.041 AUG	82. 0.315 0.050 SEP 147. 0.568 0.091 SEP	257. C.960 0.154 0C1 205. 0.766 0.123 0C1	315. 1.215 0.194 Nov 265. 1.021 0.163 HOV	122. 0.455 0.073 DEE 126. 0.470 0.075 DEC	0. 0, 3A 0. 0. 0.	0.0.	0. FEB 0.	0. 0. 0. 0. 0. 0. 0. 0.	0 0 0 0 0 0 0 0 0	• 0. 0. 0. R MAT 0. 0. 0. R MAT
COMBINED WATER REQUIREMENT (PM) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/RAT) 1966 CROP SEASON COMBINED WATER REQUIREMENT (PM) DATI WATER REQUIREMENT (L/SEC/RAT) UNIT WATER REQUIREMENT (L/SEC/RAT) 1967 CROP SEASON	0. 0. JUk 0. 0. 0. 0. Uk	161. D.600 0.096 JUL 119. 0.446 0.071 JUL	103. 0.384 0.061 AUG 68. 0.255 0.041 AUG	82. 0.315 0.050 SEP 147. 0.568 0.091 SEP	257. C.960 0.154 0C1 205. 0.766 0.123 0C1	315. 1.215 0.194 Nov 265. 1.021 0.163 HOV	122. 0.455 0.073 DEE 126. 0.470 0.075 DEC	0. 0, 3A 0. 0. 0.	0.0.	0. FEB 0.	0. 0. 0. 0. 0. 0. 0. 0.	0 0 0 0 0 0 0 0 0	• 0. 0. 0. R MAT • 0. 0. 0. R MAT
COMBINED WATER REQUIREMENT (PM) UNIT WATER REQUIREMENT (L/SEC/NA) UNIT WATER REQUIREMENT (L/SEC/NA) 1966 CROP SEASON COMBINED WATER REQUIREMENT (PM) UNIT WATER REQUIREMENT (L/SEC/NA) 1967 CROP SEASON COMBINED WATER REQUIREMENT (PM) UNIT WATER REQUIREMENT (L/SEC/NA) UNIT WATER REQUIREMENT (L/SEC/NA) UNIT WATER REQUIREMENT (L/SEC/NA) UNIT WATER REQUIREMENT (L/SEC/NA) UNIT WATER REQUIREMENT (L/SEC/NA)	0. 0. juk 0. 0. 0. juk 0. juk 0.	161. D.600 O.096 JUL 119. O.446 O.071 JUL 80. D.297 G.048 JUL	103. 0.384 0.061 AUG 68. 0.255 0.041 AUG 186. 0.696 0.111 AUG	82. 0.315 0.950 56P 147. 0.568 0.991 56P 82. 0.315 0.050 56P	257. C.960 C.154 OC1 205. C.766 O.123 OC7 286. 1.066 C.171 OCT	315. 1.215 0.194 NOV 265. 1.021 0.163 NOV 284. 1.096 0.175 NOV	122. 0.455 0.073 DEC 126. 0.470 0.075 DEC 128. 0.478 0.077	G O, JA: D, D, G, JA: O, JA: D, JA: JA:	0. 0. 0. 0.	0. FEB 0. FEB	0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	0 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0
COMBINED WATER REQUIREMENT (PM) UNIT WATER REQUIREMENT (L/SEC/NA) UNIT WATER REQUIREMENT (L/SEC/NA) 1966 CROP SEASON COMBINED WATER REQUIREMENT (PM) UNIT WATER REQUIREMENT (L/SEC/NA) 1967 CROP SEASON COMBINED WATER REQUIREMENT (PM) UNIT WATER REQUIREMENT (L/SEC/NA) UNIT WATER REQUIREMENT (L/SEC/NA) UNIT WATER REQUIREMENT (L/SEC/NA) UNIT WATER REQUIREMENT (L/SEC/NA) UNIT WATER REQUIREMENT (L/SEC/NA)	0. 0. juk 0. 0. 0. juk 0. juk 0.	161. D.600 O.096 JUL 119. O.446 O.071 JUL 80. D.297 G.048 JUL	103. 0.384 0.061 AUG 68. 0.255 0.041 AUG 186. 0.696 0.111 AUG	82. 0.315 0.950 56P 147. 0.568 0.991 56P 82. 0.315 0.050 56P	257. C.960 C.154 OC1 205. C.766 O.123 OC7 286. 1.066 C.171 OCT	315. 1.215 0.194 NOV 265. 1.021 0.163 NOV 284. 1.096 0.175 NOV	122. 0.455 0.073 DEC 126. 0.470 0.075 DEC 128. 0.478 0.077	G O, JA: D, D, G, JA: O, JA: D, JA: JA:	0. 0. 0. 0.	0. FEB 0. FEB	0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	0 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0
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COMBINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/HA) 1966 CROP SEASON COMBINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (L/SEC/HA) 1967 CROP SEASON COMBINED WATER REQUIREMENT (L/SEC/HA) 1968 CAOP SEASON COMBINED WATER REQUIREMENT (L/SEC/HA) 1968 CAOP SEASON COMBINED WATER REQUIREMENT (L/SEC/HA) 1968 CAOP SEASON COMBINED WATER REQUIREMENT (L/SEC/HA) 1969 CROP SEASON COMBINED WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/HA) 1969 CROP SEASON COMBINED WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/HA) 1970 CROP SEASON COMBINED WATER REQUIREMENT (L/SEC/HA)	0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	161, D.600 0.098 JUL 119. 0.071 JUL 80.297 C.048 78. 0.291 0.047 JUL 78. 0.047 JUL 78. 0.048 JUL 0.048 JUL 0.048 JUL 0.048 JUL 78. 0.048 JUL 78. 0.048 JUL 78. 0.048 JUL 78. 0.048 JUL 78. 0.0498 JUL 90.098 JUL 19. 0.0440 JUL 19. 0.040 JUL 19. 0.0440 JUL 19. 0.0440 JUL 19. 0.0440 JUL 19. 0.0440 JUL 19. 0.0440 JUL 19. 0.0440 JUL 19. 0.0440 JUL 19. 0.0440 JUL 19. 0.0440 JUL 19. 0.0440 JUL 19. 0.0440 JUL 19. 0.0450 JUL 10.04500 JUL 10.04500 JUL 10.04500 JUL 10.04500 JUL 10.04500 JUL 10.04500 JUL 10.04500 JUL 10.04500 JUL 10.04500 JUL 10.04500 JUL 10.04500 JUL 10.04500 JUL 10.04500 JUL 10.04500 JUL 10.04500 JUL 10.0450	103. .0.384 0.061 AUG 0.85 0.041 AUG 186. 0.415 186. 0.111 AUG 187. 3.700 0.312 AUG 340. 1.2248 0.201 AUG 340. 1.2248 0.235 AUG 340. 1.2248 0.235 AUG 1.2248 0.235 AUG 1.2555 1.255 1.255 1.255 1.255	82. 0.315 0.950 56P 147. 0.568 0.991 56P 82. 0.050 56P 155. 0.592 56P 155. 0.592 56P 155. 0.592 56P 155. 0.595 56P 155. 0.595 56P 155. 0.595 56P 155. 0.595 56P 155. 0.595 56P 155. 0.595 155. 155	257. C.960 C.154 0C1 205. 0.766 0.123 0C1 286. 1.066 C.171 0C1 268. C.999 G.160 0C1 266. 0.459 0.559 0.150 0.754 0.754 0.754 0.755 0	315, 1-215 0-194 Nov 265- 1-021 0-163 Nov 284- 1-096 0-175 Nov 334- 1-287 0-206 Nov 320- 1-287 0-206 Nov	122- 0-455 0-073 bec 126- 0-470 0-075 bec 128- 0-477 0-677 0-677 0-677 0-677 0-677 0-677 0-677 0-677 0-677 0-677 0-677	0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	0. 7EB 0. 7EB 0. 7EB 0. 7EB	0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	O.
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Table VII-5IRRIGATION WATER REQUIREMENT FORPRESENT CONDITION, SEMI-IRRIGATED FIELD (2/2)

		1.1.1					· · ·	5	÷.,				
1974 CROP SEASON	NUL	101.	AUG	5EP	007	NOV	950	JAN		FEÐ	MAR	. AP	1 A R
CONDINED WATER REQUIREMENT (MM)	0.	83.	161,	82.	205.	243	123.	0.		ο,	0.	0.	0.
UNIT WATER REQUIREMENT (LISECINA) UNIT WATER REQUIREMENT (LISECIRAL)) 0,	0.050	20403 04040	-0.315 0.050	-0+766 0+123	_0+936 0+150	0.460	0	0, 0,		0	0 0.	-0. 0.
1975 CROP SEASON		101					DEC	بهدر		·	MAR		MAY
COMBINED WATER REQUIREMENT (PM)	0.	86.	136	- 137.	248.	144.	121.	<u>-</u> .	i	G.	G.	0.	G .
INIT WATER REQUIREMENT (L/SEC/HA). UNIT WATER REQUIREMENT (L/SEC/RAI)	·····0• ····· > 0•	0.320	0.081	0.530	D.925	0-555	0.453	0	0. 0.	•	0	0. <u></u>	-0
1976 CROP SEASON	i da cara da c	JUL			i.	Nov	الد المرسيد		. z . j	FEB			
			<u> </u>		in the second		· · · · ·					AP 8	. HAY
COMBINED WATER REQUIREMENT (MM) UNIT_WATER_REQUIREMENT_LLISEC/HA)	о. С.	106. 0.397	. 83 0.255	99. 1381 0	208.	253.	.128.	0.	•	۰.	0.	្ច	, 0 .
UNIT WATER REQUIREMENT (LISEC/RAL)	0.	0.063	0-041	0.061	0-125	0.156	0.077	0.	ο.		0.	0.	0.
1977 CROP SEASON	JUN	JUL	ÁUG	51P	003	NOV	DEC	JAH		F E 8	RAR	APR	MAT
CONBINED WATER REQUIREMENT (MM)			72.		305.	337.	.119.	0.		0	0.	0.	0,
UNIT_WATER_REQUIREMENT_EL/SEC/HA) Unit_water requirement_el/sec/rai)		0.079	0.043	0.058	0.182	1.301 0.208	0.446	0. 0.	0.		0	- 0 0 .	0
1978 CROP SEASON	Jux	JUL	AUG	5 E P	OC T	NOV	DEC	JAN		FE8	MAR	APR	HAT.
CORBINED WATER REQUIREMENT (MA)	0.		164.	90.	. 279.	337.	128.	0.	·	0.	0.	С.	. 0.
UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/RA)	0	0.112	0.61	-0-348		0.208	0.478	Q.∎' .					_0
WAIL WATER RECOVERED LEVELVENT		0.010	0.030	0,010	0.107	u.200	0.077	0	¢.		0.	0.	0
1979 CROP SEASON	109	JUL	AUG	SEP	001	NOV	DEC	JAN	i	FEB	MÁR	- APR	HA3
COMBINED WATER REQUIREMENT (MM)		87.	120.	82.	392.	337.	128.	0.		ΰ.	0.	0.	0,
UNIT VATER REQUIREMENT (L/SEC/HA).	·	0.323	0.448	_0+315	.1+4.63	1.301	0,478	0					~ Ø
UNIT WATER REQUIREMENT (L/SEC/RAI) (). 	0.052	0.072					0.	.0.		0.	0.	0.
1980 CROP SEASON	JUN	JUL	AUC	SEP	001	NDV	DEC	144	-	FEB	NAR	APR	MAT
CONDINED WATER REQUIREMENT (MM)			102.			167.				0.	0.		
<u>Unit wäter Requirement (L/Sec/KA)</u> Unit water Requirement (L/Sec/RA)						0.103			. U.		0.	0.	
1981 CROP SEASON		101					· · ·		·				
						NOV	DEC.	JAN		FEB	#AF		
COMBINED WATER REQUIREMENT (MM) <u>UNIT WATER REQUIREMENT (L/SEC/HA</u>)	0.	60. 0-223	157	109.	237.	100.	128			0.	, o.		

IRRIGATION WATER REQUIREMENT FOR WITH-PROJECT CONDITION (CROPPING INTENSITY 120 %) (1/2)

Table VII-6

		1.1.12				A set of the	6 N.	da e s	2000	·	1 g 1	6
1554 CROP SEASON	JUN	1.445.000		SEP			나는 것 같아.	JAN		MAR	APR	RAY
COMBINED WATER REQUIREMENT (HM) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REGUIDEMENT (L/SEC/HAI)	0. V.	123.	104.	113.	700	128.	16.	7.	47.	33. 0.123	14.	U.
							S 4 - 53	11 de 1	Nie o	وبالأثوق		u.
1955 CROP SEASON	JUN		AUG	SEP	, 0C1 			JAH		AR NAR	APR.	HAY
CONBINED WAYER REQUIREMENT (#M) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/HAI)	0. U.	C.360	U.321	U-578	0.805	70. 0.268 0.643	0.060	0.026	0,167	0.231	U.U.S.S. 0. U.D.S	0.
1954 CROP SEASON		JUL		SEP	061	Mr Gal	DEC	JAN	₽EÐ		APR	
CONDINED WATER REQUIREMENT	Ó.	153.	105.	98.	157.	122.	16.	7.	42.	36.	. 12.	0.
UNIT WATER REQUIREMENT (L/SEC/HAT) UNIT WATER REQUIREMENT (L/SEC/RAT)	U.	C. 092	0.043	0.061	9.094	0.075	0.000	0,004	0.028	0.022	0.007	0.
1957 CROP SEASON	12.2				과 문문	NOV		JAN	169	MÁR		PAY
CONBINED SATEN REQUIREMENT (PN) UNIT WATER REQUIREPENT (L/SEC/HA)	0.	216.	0.384	Ω. s.7 .8	0.555	131.	0.060	0.021	0.152	0.264	15.	U
UNIT VATER REQUIREMENT (L/SEC/RAL)	U. JUN	101				1.011	1.000	JAN	1.19		81 J.M.	U. NAT
COMBINED WATER REQUIREMENT (PM)	۶.	138.		- C	205.	131.		الم المحديث			<	1.00
UNIT WATER REQUIREPENT (L/SEC/HA) UNIT WATER REQUIREPENT (L/SEC/RAI)	U. 17.	0.514 0.062	0.229	0.378 U.061	0.122	0.505	0.000	0.025 0.064	0.175	0.235	a 002 0.002	υ. Ο.
1759 CROP SEASON		JÜL	se 1, 17	4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	sel e d	ноч		S		MAR	alah karang sarang s Sarang sarang	
COMBINED WATER REQUIREMENT (P*) UNIT WATER REQUIREMENT (L/SEC/MA)	0. U.	141.	103.	98. J. 578	186.	116. 0,446	16. U.U6U	0.025	43.	64. 0.238	12.	U. 0.
UNIT WATER REQUIPEMENT (LISECIPAL)	0.	0.084	C 113	3.061	0.111	0.071	9,010	0.004	0.028 FEB	0.038	U_007	0.
1960 CROP SEASON COMBINED WATER REGUIREMENT	10×	162.	812	SEP	1474	83.	DEC 16.	7.	(<u></u>	<u></u>
UNIT WATER REGUIREMENT (L/SEC/RA) UNIT WATER REGUIREMENT (L/SEC/RAI)	Ű.	0.380	·U. 393	0.400	0.547	0.321	0.000	0.026	4.164	0.234	0.050	U.
1961 CROP SEASON	1.190			57.	1.11	NOV	Sec. 19.	1971	t stand	1.00	APR	
COPBINED WATER REQUIREMENT (MM) UNIT WATER REGUIREMENT (L/SEC/HA)	С. –	177.	01603	152. U.585	0.518	0.305	16. D.USU	. U U C O	0.193	0.264	11.	0.
UNIT WATER REQUIREMENT (L/SEC/PAT)	U.	C. 156	5.096	0.094	0.058	0.081	8.010	0.004	0.031	0.042	1000	υ.
1962 CROP SEASON	1 A A A	UUL S		Sec. 1	5 A.A	NOV	1.1.1	281,268	1	MAR		NAT
CORBINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (L/SEC/MA) UNIT WATER REQUIREMENT (L/SEC/MAI)	6.	U.997	0.457	0.378	0.572	131. U.SDS U.U81	0.000	0.050	0.193	0.264	¥7. U.U64 U.U1U	ύ_
1963 CROP SEASON					and a second	NOV	1.1	- 11 - 11 -	· /	1	APR	PAT
COMBINED WATER REQUIREMENT (MM)		19:	121.	103.	169.	61. 0.235	16.				12.	
		0.113	C.015	0.064	0.101	0.038	0.010	0.004	0.028	0.039	0.000	0.
1964 CROP SEASON Corbined water requirement (44)	14 J. 14	102.	11 A.		0CT	NDY 123.	$i_{j} \in \{i_{j}\}$		FEB 41.	HAR 69.	APP 16.	
	L	J. 36	0,611:	0.372	0.596	C.475	0.055	920.05	0.169	0,184	0.060	0,
1565 CROP SEASO	JUN	JUL	ÂUG	\$EP	001	NCV	DEC	JAR	FE8	MAR	AP R	RAT
COMBINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (LISEC/HA)	0. 0.	253.	106.	93. 0.376	126.	121. C.469	15.	Z. J.U07	40. 0.165	58.	13.	C.
UNIT WATER REQUIPEPENT (L/SEC/RAI)	U .	L.151	U.U63	0.061	3.111	U_U/3	0.004	0.061	0.020	0.033	0.000	ų,
1566 CROP SEASON	JUN	JUL	i parti	SEP	19. J.Y.	160.	111	JAN	FEB	1.1	111	PAT
COPBINED WATER REGUIREMENT (141) UNIT WATER REGUIREMENT (L/SEC/HAJ UNIT WATER REGUIREMENT (L/SEC/RAI)	0.		1. 311	11.562	0.567	160. 0.327 0.062	0.059	0.026	0.193	0.244	0.032	0
1567 CROP SEASON				- 10 gener	1.1	►C¥	1. C		이 안 같은 것이 같	MÅR		
OPBINED WATER PEGUIREPENT (P2)	0.	155.	164.	9E.	21.5.	101.	16.	. 7.	46.	54.	12.	0.
UNIT WATER RECUIPEMENT (LISECIHA)		0.594	U.014	516.0					0.171	0.676	0.0040	1 ·
UNIT WATER REQUIREMENT (LISECIRAL)	U.	6.095	0.095	6.261	J+124	2.261	0.010	0.004	0.031	D-032	300.0	
UNIT WATER REGUIPEPENT (L/SEC/RAI) 1968 CROP SEASON	JUN	101	AUG	G.UCI SEP	J.124 0CT	L.UE1 46¥	0.010 DEC	141 141	0,031 JEB	D.U32 NAR	APR	PAT
UNIT WATER REGUIPEPENT (L/SEC/RAI) 1968 CROP SEASON	JUN	101	AUG	G.UCI SEP	J.124 0CT	L.UE1 46¥	0.010 DEC	141 141	0,031 JEB	D.U32 NAR	APR	PAT
UNIT WATER REGUIREMENT (L/SEC/RAI) 1968 (ROM SEASON Combined Nater Reguirement (MM) JNIT Water Reguirement (L/Sec/RAI) JNIT WATER REGUIREMENT (L/SEC/RAI)	увн С. U. С.	101 157. 0.587 0.094	406 .165. 0.617 0.099	6.001 SEP 151. 0.585 0.093	J.124 057 194. J.726 J.116	46¥ 46¥ 125. 0.499 6.083	0.019 887 16. 0.060 0.010	0.004 J4x 0.024 0.024	U.U31 JE8 47. U.193 0.U31	D.U32 NAR 65. D.241 0.039	APR	рат 0. 0.
UNIT WATER REGUIREPENT (L/SEC/RAI) 1968 (ROP SEASON Copoines Later Reguirepent (PV) Onit water Reguirepent (L/Sec/RAI) Nit water Reguirepent (L/Sec/RAI) 1969 (ROP SEASON Combined Later Reguirepent (PV)	JUN C. U. JUN C.	JUL 157. 0.587 0.094 JUL 142.	AUG .165. 9.617 C.099 AUG 275.	6.001 SEP 151. 0.005 0.093 SEP 40.	J.124 OCT 194. 3.726 J.116 OCT 193.	L.U.C.F 467 125. 0.459 6.080 HOY 124.	0.010 <i>DEC</i> 16. U.U60 0.010 0EC 16.	0.004 JAK 0.024 0.024 JAH 7.	U.U31 <i>JEB</i> 47. U.193 0.U31 fEB 43.	D.U32 NAR 65. D.241 0.039 MAR	APR 10. U.U35 U.D06 APR	рат 0. 0. 5. елт 0.
UNIT WATER REGUIREPENT (L/SEC/RAI) 1968 (ROP SEASON Copoines Later Reguirepent (PV) Onit water Reguirepent (L/Sec/RAI) Nit water Reguirepent (L/Sec/RAI) 1969 (ROP SEASON Combined Later Reguirepent (PV)	JUN C. U. JUN C.	JUL 157. 0.587 0.094 JUL 142. 0.529	AUG .165. 9.617 C.099 AUG 275. 1.537	6.001 SEP 151. 0.003 0.093 SEP 9.378	J.124 OCT 194. 3.726 J.116 OCT 193. U.721	L.U.C.F 46¥ 125. U.499 C.080 HOY	U.U4U DEC 16. U.U6C G.U10 OEC 16. U.U6U	0.004 JAX 0.024 0.024 JAN 7. 0.026	U.U31 <i>JEB</i> 47. U.193 0.U31 fEB 43. U.179	D.U32 NAR 65. D.241 0.039 NAR 40. 0.151	APR 10. U.U35 U.D06 APR 9. U.U57	РАТ 0- 0- 5- БАТ 0- 0-
UNIT WATER REGUIREPENT (L/SEC/RAI) 1968 (ROP SEASON COPBINES NATER REGUIREPENT (PM) UNIT WATER REGUIREPENT (L/SEC/RAI) UNIT WATER REGUIREPENT (L/SEC/RAI) 1969 (ROP SEASON CORBINED WATER REGUIREPENT (L/SEC/RAI) UNIT WATER REGUIREPENT (L/SEC/RAI) 1970 (ROP SEASON	<i>ни</i> С. С. Јик С. Јик	101 157. 0.567 0.094 JUL 142. 0.529 0.525 JUL	AUG 165. 0.617 0.099 AUE 275. 1.537 0.126 AUG	G.261 SEP 151- U.285 G.291 SEP 93- U.276 G.061 SEP	J.124 0CT 194. J.726 J.116 0CT 193. J.721 J.115 0CT	L. LEF 464 125. U.459 C.025 HOY 124. U.477 0.076 NOV	U.UUU DEC 164 U.U6C G.U10 CEC 164 U.U6U D.U10 DEC	0.004 JAX 0.024 0.024 JAN 7. 0.026 0.026	U.U31 <i>FEB</i> 47. U.193 0.U31 FEB 43. U.179 U.U29	D.U32 NAR 65. D.241 0.039 MAR 40. 0.151 0.U24	APR 10. U.U35 U.D06 APR 9. U.U57	рат 0. 0. 5. 8ат 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
UNIT WATER REGUIREMENT (L/SEC/RAI) 1568 CROP SEASON COPBINES LAIEA REGUIREMENT (L/SEC/RAI) NIT WATER REGUIREMENT (L/SEC/RAI) 1569 CROP SEASON COMBINED LATER REGUIREMENT (L/SEC/RAI) UNIT WATER REGUIREMENT (L/SEC/RAI) 1570 CROP SEASON COMBINED WATER REGUIREMENT (MM) INT WATER REGUIREMENT (MM) INT WATER REGUIREMENT (MM)	JBN C. U. JUN C. U. JUN JUN V.	JUL 157. 0.587 0.094 JUL 142. 0.529 0.225 JUL 173. L.647	AUG .165. 0.617 C.099 AUG 275. 1.537 C.T26 AUG 1255 C.472	G.261 SEP 151- G.265 G.291 SEP 9.46- G.278 0.061 SEP 137- G.527	J.124 0CT 194. J.726 J.116 0CT 193. J.115 0C1 169. J.652	L. LC / 4 GY 125. U. 4 5 Y G. U 2 5 HOY 124. U. 4 7 7 U. 4 7 4 HOY 112. U. 4 5 4	U.UtU DEC 16. U.U&C G.U10 OEC 16. U.U&D D.U1U DEC 15. U.U57	0.004 JAA 0.024 0.024 JAA G.026 JAA JAA JAA S. 0.020	U.U31 <i>JEB</i> 47. U.193 Q.U31 <i>FEB</i> 43. U.179 U.U29 <i>FEB</i> 40. U.164	D.U32 MAR 0.241 0.039 MAR 0.151 0.U24 MAR MAR 0.255	AP# 10. U.U35 U.D06 APR U.U57 U.U57 APR 10. U.U34	рат О. С. ЯАТ О. О. О. О. О. О. О. О. О. О. О. О. О.
UNIT WATER REQUIREMENT (L/SEC/RAI) 1968 (ROP SEASON COMBINES NATER REGUIREMENT (L/SEC/HA) UNIT WATER REGUIREMENT (L/SEC/HA) UNIT WATER REGUIREMENT (L/SEC/HA) ONES NATER REGUIREMENT (L/SEC/HA) UNIT WATER REGUIREMENT (L/SEC/HA) 1570 (ROP SEASON COMBINED WATER REGUIREMENT (L/SEC/HA) UNIT WATER REGUIREMENT (L/SEC/HA)	388 C. C. JUN C. U. JUN U. JUN U. JUN U. U.	JUL 157. 0.557 0.094 JUL 142. 0.529 0.525 JUL 173. 1.0647 0.104	406 165. 0.617 0.099 AUE 1.537 0.126 AUG 125% 0.472 0.075	G.261 SEP 151- C.285 G.293 SEP 46. C.278 O.061 SEP 137- C.527 G.964	J.124 0CT 194. J.726 J.116 0CT 193. U.721 J.115 0CT 169: U.22 U.101	L. CE / *GY 125. U. 469 G. CE 2 ROY 124. U. 477 D. U75 NOV 112. U. 454 O. C73	U.U1U 0Ef 16. U.U6C 0.010 0EC 16. U.U6U 0.010 0EC 15. U.U37 0.009	D.004 JAA 0.024 G.024 G.024 JAA 7. G.026 D.004 JAA JAA S. O.020 O.063	U.U31 <i>JEB</i> 47. U.193 0.U31 <i>FEB</i> 43. U.179 U.129 <i>FEB</i> 40. U.164 U.126	D.U32 MAR 65- D.241 D.U39 MAR 40- 0.151 0.U24 MAR 68- 0.255 0.U41	APR 10. U.U35 U.U35 4PR 9. U.U37 U.U37 U.U37 U.U34 0. U.U34 0. U.U34 0. U.U34 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	рат 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
UNIT WATER REGUIREMENT (L/SEC/RAI) 1568 CROP SEASON COPBINES LAIEA REGUIREMENT (L/SEC/RAI) NIT WATER REGUIREMENT (L/SEC/RAI) 1569 CROP SEASON COMBINED WATER REGUIREMENT (***) UNIT WATER REGUIREMENT (L/SEC/RAI) 1570 CROP SEASON COMBINED WATER REGUIREMENT (M**) UNIT WATER REGUIREMENT (L/SEC/RAI) 1570 CROP SEASON 1971 CROP SEASON	JUN C. U. U. U. U. JUN U. U. JUN U. JUN	JUL 157. 0.557 0.094 JUL 142. 0.529 0.525 JUL 173. 1.047 0.134 JUL	406 165. 0.617 0.099 AUG 1.537 0.126 AUG 125. 0.075 AUG	G.201 SEP (5285 G.291 SEP (46. G.201 SEP (46. SEP (137. G.352) G.064 SEP	J.124 0CT 194. J.726 J.726 0CT 193. J.135 0CT 169. J.652 U.101 0CT	L.UC47 46¥ 125. U.454 G.UE3 HOY 124.7 0.U76 HOY 112. U.454 0.U73 HOY	U.UUU PEC 16. U.UUC G.010 0EC 16. U.USU D.UUU DEC 15. U.US7 O.UUY 0EC	0.004 JAA 0.024 0.026 JAW 7. G.026 D.020 JAA S. D.020 O.023 JAA	U.U31 <i>JEB</i> 47. U.193 0.U31 <i>FEB</i> 43. U.179 V.U29 <i>FEB</i> 40. U.164 U.164 V.026 <i>FEB</i>	D.U32 NAR 65: 0.241 0.039 NAR 0.151 0.024 MAR 0.255 0.041 PAR	APR 10. U.U35 U.U35 U.U37 U.U37 U.U37 U.U37 U.U34 APR APR	рат 0- 0- 0- 0- 0- 0- 0- 0- 0- 0-
UNIT WATER REGUIREPENT (L/SEC/RAI) 1968 CROP SEASON COPBINES NATER REGUIREPENT (PM) UNIT WATER REGUIREPENT (L/SEC/RAI) ISOP CROP SEASON COMBINED NATER REGUIREPENT (L/SEC/RAI) UNIT WATER REGUIREPENT (L/SEC/RAI) 1970 CROP SEASON COMBINED NATER REGUIREPENT (L/SEC/RAI) 1971 CROP SEASON COMBINED NATER REGUIREPENT (L/SEC/RAI) 1971 CROP SEASON COMBINED NATER REGUIREPENT (L/SEC/RAI) 1971 CROP SEASON COMBINED NATER REGUIREPENT (L/SEC/RAI)	JUN C. C. JUN C. U. JUN JUN C. JUN C.	301 157. 0.587 142. 0.225 JUL 142. 0.225 JUL 173. 1.04 JUL 153. 0.552 JUL 155. 0.552 101 155. 1	406 165. 0.699 275. 1.537 0.156 406 125: 0.975 409 409 20075 409 409 400 400 400 400 400 400 400 400	G-061 SEP 151- C-265 G-091 SEP 46- C-061 SEP 137- G-061 SEP 137- G-064 SEP 137- G-064 SEP 137- C-064 SEP	J.124 0C7 194. J.726 J.116 0C7 193. J.735 0C1 169. J.652 U.301 0C7 172. J.64.	L. LEP 46¥ 125. 1.459 4.059 4.059 1.0477 0.076 NOV 112. 1.12. 1.12. NOV 1.12. 1	U.UtU DEC 16. U.U6U G.U10 CEC 16. U.U6U D.U10 DEC 15. U.U57 O.UU9 DEC 16. U.U57 0.059	D.UO4 JAA O.U24 O.U24 O.U24 JAA JAA JAA JAA JAA JAA JAA JAA Z.U26	U.U31 <i>JEB</i> 47. U.103 0.U31 <i>fEB</i> U.17V U.U29 <i>FEB</i> 40. U.164 U.026 <i>FEB</i> 45. U.38/ U.38/ U.38/ U.38/ U.38/ U.38/ U.38/ U.38/ U.38/ U.38/ U.17V	D.U32 MAR 0.241 0.039 MAR 0.151 0.U24 MAR 0.1253 0.U24 MAR 0.255 0.U41 MAR 7G. 0.265	APR 10- 10- 10- 0- 0- 0- 0- 0- 0- 0- 0- 0-	и. 0. с. кат 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
UNIT WATER REGUIREMENT (L/SEC/RAI) 1568 CROP SEASON COPBINES LAIEA REGUIREMENT (L/SEC/RAI) NIT WATER REGUIREMENT (L/SEC/RAI) 1569 CROP SEASON COMBINED WATER REGUIREMENT (***) UNIT WATER REGUIREMENT (L/SEC/RAI) 1570 CROP SEASON COMBINED WATER REGUIREMENT (M**) UNIT WATER REGUIREMENT (L/SEC/RAI) 1570 CROP SEASON 1971 CROP SEASON	JUN C. C. JUN U. JUN U. JUN C. JUN C. JUN C. JUN	301 157. 0.587 142. 0.225 JUL 142. 0.225 JUL 173. 1.04 JUL 153. 0.552 JUL 155. 0.552 101 155. 1	406 165. 0.617 C.099 AUE 275. 1.537 C.126 AUG 125. C.472 U.075 AUG 20075 AUG 20075 AUG 20053	G.001 SEP 151. C.285 G.092 SEP 40. SEP 137. G.061 SEP 137. G.927 G.964 SEP 112. U.431 G.464	J.124 0C7 194. J.726 J.116 0C7 193. J.735 0C1 169. J.652 U.301 0C7 172. J.64.	L. CE / 464 125. U.454 C.020 R04 124. U.477 0.076 N04 112. U.454 0.073 R04 131. C.565 C.001	U.UtU DEC 16. U.U6U G.U10 CEC 16. U.U6U D.U10 DEC 15. U.U57 O.UU9 DEC 16. U.U57 0.059	0.004 JAA 0.024 0.024 0.024 JAA 7. 0.026 JAA 0.020 0.004 JAA JAA 2. 0.023 JAA 7. 0.023 JAA 7. 0.023 JAA	U.U31 <i>JEB</i> 47. U.103 0.U31 <i>fEB</i> U.17V U.U29 <i>FEB</i> 40. U.164 U.026 <i>FEB</i> 45. U.38/ U.38/ U.38/ U.38/ U.38/ U.38/ U.38/ U.38/ U.38/ U.38/ U.17V	D.U32 MAR 0.241 0.039 MAR 0.151 0.U24 MAR 0.1253 0.U24 MAR 0.255 0.U41 MAR 7G. 0.265	APR 10- 10- 10- 0- 0- 0- 0- 0- 0- 0- 0- 0-	илт 0. С. Алт 0. О. О. О. С. Алт 0. О. О. О. О. О. О. О. О. О. О. О. О. О.
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UNIT WATER REGUIREPENT (L/SEC/RAI) 1568 CROP SEASON COPBINES LAIEA REGUIREPENT (L/SEC/RAI) NIT WATER REGUIREPENT (L/SEC/RAI) 1569 CROP SEASON COMBINED LATER REGUIREPENT (L/SEC/RAI) UNIT WATER REGUIREPENT (L/SEC/RAI) 1570 CROP SEASON COMBINED LATER REGUIREPENT (L/SEC/RAI) 1570 CROP SEASON COMBINED LATER REGUIREPENT (L/SEC/RAI) 1971 CROP SEASON COMBINED LATER REGUIREPENT (L/SEC/RAI) 1972 CROP SEASON	JUN C. C. JUN C. U. JUN C. JUN C. JUN C. JUN C. JUN C. C. JUN C. C. C. C. C. C. C. C. C. C. C. C. C.	JUL 157. 0.567 0.094 JUL 142. 0.529 JUL 173. 151. 0.559 JUL 154. 0.559 JUL	406 165. 0.617 0.099 AUE 275. 1.037 0.126 AUE 125. 0.075 AUE 0.053 AUE 0.053 AUE 0.361 0.361	G. 06.1 SEP 151. G. 091 SEP 45. G. 060 137. G. 527 G. 064 137. G. 527 G. 064 SEP 112. U.431 G. 659 SEP 96. G. 576	J. 124 0CT 194. J. 726 J. 116 0CT 193. 0CT 193. 0CT 193. 0CT 194. 0.115 0CT 149. U.C32 U.C32 U.C41 2.122 0CT 172. U.C41 2.122 0CT 174. 0.125 0CT 143. 0CT 194. 0CT 104. 0CT 105	L. Cer 464 125. U.464 C. Ceo Roy 124. U.477 D.476 Nov 124. S. Co S. So L.555 L.565 L.565 L.061 Nov	U,U1U PEC 16- 16- 10- 10- 10- 10- 10- 10- 10- 10	0.004 JAA 0.024 0.024 0.024 0.026 0.026 0.026 JAA 0.026 JAA 0.023 JAA 0.023 JAA 0.023 JAA 0.023 JAA 0.024 0.026 0.026 JAA 0.027 0.026 0.00	U.U31 <i>FEB</i> 47. U.1793 0.U31 <i>FEB</i> 43. U.179 V.179 V.179 V.179 <i>FEB</i> 40. U.164 V.026 <i>FEB</i> 0.031 <i>FEB</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i> <i>Colored</i>	D.U32 MAR D.241 D.039 MAR 0.151 G.U24 MAR MAR 0.253 G.U41 D.262 D.042 D.042 C.0441 D.262 D.042 D.042 C.0441 C.262 D.042 C.0441 C.044	APR U_U35 U_D06 APR U_U57 U_U07 U_U07 U_U07 APR U_U37 U_U07 APR U_U20 APR APR U_U20 APR APR 10- U57 U_U37 U_U37 U_U37 U_U07 APR APR APR APR APR APR APR APR	PAT 0. C. PAT U. RAT U. RAT U. RAT U. FAT U. G. G. FAT O. U.
UNIT WATER REGUIREMENT (L/SEC/RAI) 1568 CROP SEASON COMBINES LAIEA REGUIREMENT (L/SEC/RAI) NIT WATER REGUIREMENT (L/SEC/RAI) 1569 CROP SEASON COMBINED LATER REGUIREMENT (L/SEC/RAI) 1570 CROP SEASON COMBINED LATER REGUIREMENT (L/SEC/RAI) 1570 CROP SEASON COMBINED WATER REGUIREMENT (L/SEC/RAI) 1570 CROP SEASON COMBINED WATER REGUIREMENT (L/SEC/RAI) 1571 CROP SEASON COMBINED WATER REGUIREMENT (L/SEC/RAI) 1971 CROP SEASON COMBINED WATER REGUIREMENT (L/SEC/RAI) 1971 CROP SEASON COMBINED WATER REGUIREMENT (L/SEC/RAI) 1572 CROP SEASON COMBINED WATER REGUIREMENT (L/SEC/RAI) 1572 CROP SEASON COMBINED WATER REGUIREMENT (MM) UNIT WATER REGUIREMENT (L/SEC/RAI) 1572 CROP SEASON	JUN C. C. JUN C. JUN C. JUN C. JUN C. JUN C. JUN C. JUN C. JUN C. JUN JUN C. JUN	402 157. 0.587 0.094 142. 0.529 0.525 JUL 173. 173. 173. 173. 152. 0.069 JUL 152. 0.576 2.392 JUL 154. 0.576 2.392 JUL	Aug 165. 0.617 C.099 Aug 275. 1.037 Aug 125. C.472 0.075 Aug 0.354 C.033 Aug 0.341 C.035 Aug	G.UCI SEP 151- C.S25 G.D51 SEP V0.U SEP 137- G.V54 SEP 137- G.V54 SEP 132- G.V54 SEP 132- G.S74 U.S37 SEP SEP SEP	J,124 067 194. 194. 194. 194. 194. 194. 194. 047 194. 194. 047 194. 1	L. LEP 464 125. U.459 C.UEJ 404 124. U.477 0.U76 NOV 112. U.454 0.U73 NOV 131. C.505 C.001 NOV 331. C.505 C.001 NOV	U,U1U 0EC 16. 0EC 10. 0EC 10. 0EC 15. 0.009 0EC 16. 0.0057 0.0052 0EC 14. 0.052 U.U08 0EC 14. 0.052 0EC	0.004 JAA 0.024 0.024 0.026 0.026 0.026 JAA 0.026 JAA 0.026 JAA 0.026 JAA 0.026 JAA 0.026 JAA	U.031 <i>FEB</i> 47. U.193 FEB 43. U.17V U.029 FEB 40. V.164 U.020 FEB 40. 45. U.164 U.020 FEB 46. 0.030 FEB FEB FEB FEB FEB FEB FEB FEB	D.U32 MAR 65. D.241 0.039 MAR 20. 0.039 MAR 20. 20. 20. 20. 20. 20. 20. 20. 20. 20.	AFR U.U35 U.D06 AFR U.U57 U.U05 U.U05 AFR U.U37 U	PAT 0. C. PAT C. PAT U. RAT U. RAT U. RAT U. FAT U. FAT U. FAT U. FAT U. FAT U. WAT

Table VII-6IRRIGATION WATER REQUIREMENT FOR WITH-PROJECT
CONDITION (CROPPING INTENSITY 120 %) (2/2)

1974 CROP SEASCH JUN AUG SEP OCT JUL NOV 010 JAN FEB APR 165. 147, 98. 147, 91, 15. L.610 U.546 U.578 U.547 G.551 U.456 D. L.610 U.546 U.578 U.547 G.551 U.4009 G. CONDINCA WATER REQUIREMENT (***) UNIT WATER REQUIREMENT (L/SEC/HA) 44. 56. 14. U.182 D.188 U.D56 D. U.U29 O.U30 U.009 O. 50. 0, 0. Ő. υ. UNIT WATER REQUIREMENT (L/SEC/RAI) C. 1975 CROP SEASON JUN JUL AUG SEP 001 NOV · DEC JAR FEB APR RAR BAT EDMBINED WATCH REQUIREMENT (MM) UNIT WATCH REGUIREMENT (L/SEC/MA) UNIT WATCH REGUIREMENT (L/SEC/MAI) 366. 129. 139. 179. 49. 15. 7. 46. 37. 15. C.621 0.481 0.534 U.662 U.189 0.057 0.026 U.188 U.138 U.U56 U. U.599 U.077 0.085 U.107 U.U30 D.VU9 0.006 U.U30 0.022 U.009 0. 0 ò. Û. U. 1976 CROP SEASON JUN JUE AUG SEP 001 NOV DEC JAN 1 FB 21.4 R RAT CONBANES VATER REQUIREMENT. (NK) UNIX WATER REQUIREMENT. (L/SEC/MA) UNIX WATER REQUIREMENT (L/SEC/RAT) 150. 81. 110. 145: 95. 16. 7. 47. 70. 10. 6.710 0.503 0.426 0.557 0.368 0.060 0.026 0.195 0.265 0.040 0. 5.114 0.049 0.068 0.029 0.059 0.010 0.064 0.031 0.042 0.006 0. ٥. 'n. Q. ċ. 1977 CROP SEASON JUN 19L AUG SEP 011 NOV DEC JAN FEB MAY 1. 224. 84. 107. 225. 131. 15. 7. 56. 76. 8. 0.033 6.750 0.314 0.413 0.231 0.505 0.056 0.026 0.151 0.261 0.029 0. 6.000 0.122 0.050 0.056 0.133 0.061 0.009 6.004 0.024 0.042 0.005 0. CONDINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/RAT) ΰ. JUN NOV 1975 EROP SEASON Jul AUG SEP 130 0.6.0 JAR FE8 MAR APR P Å Y 132. 149. 104. 203. 131. 16. 7. 39. 71. 10. 0. 0.350 0.455 0.462 0.759 0.505 0.000 0.026 0.160 0.264 0.037 0. 0.051 0.089 0.064 0.121 0.081 0.010 0.004 0.026 0.042 0.005 0. COMBINED WATER REQUIREPENT (PM) UNIT WATER REQUIREPENT (L/SEC/HA) UNIT WATER REGUIREPENT (L/SEC/FAT) ٥. υ. DEC JAN 1979 CROP SEASON 406 SEP 001 FED 105 JUL NOV RAR APR B 4 7 COMBINED WATER REQUIREMENT (MM) Unit Water Reguirement (L/Sec/Ma) Unit Water Reguirement (L/Sec/Rai) 167. 118. 98. 289. 131. 16. 7. 45. 62. 12. C.625 U.439 U.572 1.020 U.505 U.060 G.U26 U.185 U.231 U.U48 U. L.160 U.670 G.U01 G.173 U.081 U.010 G.004 U.034 D.U37 U.006 U. 7. ο. Û, £ . . υ. 1980 CROP SEASON JUL ÂÚ G SEP OCT NOV DEC JAN FEB MAR JU. APR RAT COMBINED WATER REQUIREMENT (MM) UNIT WATER REQUIREMENT (L/SEC/HA) UNIT WATER REQUIREMENT (L/SEC/RAT) 151. 105. 116. 147. 59. 16. 7. 15. 65. 8. 5.553 U.393 O.424 U.547 G.228 D.060 O.026 U.145 O.243 U.031 D. 5.79 U.653 G.066 J.068 O.036 O.010 G.004 U.023 O.039 U.005 U. ٥. 0. ο. ς. 1981 CROP SEASON JUL AUG SEP 001 NOV 0EC JAN FEQ BAR APR MAY JUN 136. 144. 118. 171. 36. 16. 7. 45. 70. 14. C.558 0.537 5.455 5.658 0.117 0.060 0.026 0.187 0.263 0.055 0. 0.551 0.086 0.073 0.102 0.019 0.010 0.064 0.036 0.042 0.009 0. COMBINED WATER REGUIPENENT (AM) UNIT VATER REGUIREMENT (L/SEC/HA) UNIT VATER REGUIREMENT (L/SEC/FAI) - o . 0. ο. Ū.

Table VII-7 MAIN FEATURES OF IRRIGATION MODEL AREA

- 1. Head Works
- 1.1 Intake Weir
 - Type of weir Weir height Weir length 28.6 m
- 1.2 Scouring Sluice

Gate type			Slide gate		
Size of g	ate (B x H x No	.)	2.0 m x 2.0	m x 2 nos	3

1.3 Intake Structure

Intake discharge	7.36 m ³ /sec
Gate type	Slide gate
Size of gate (BxHxNo.)	2.0 m x 1.8 m x 3 nos

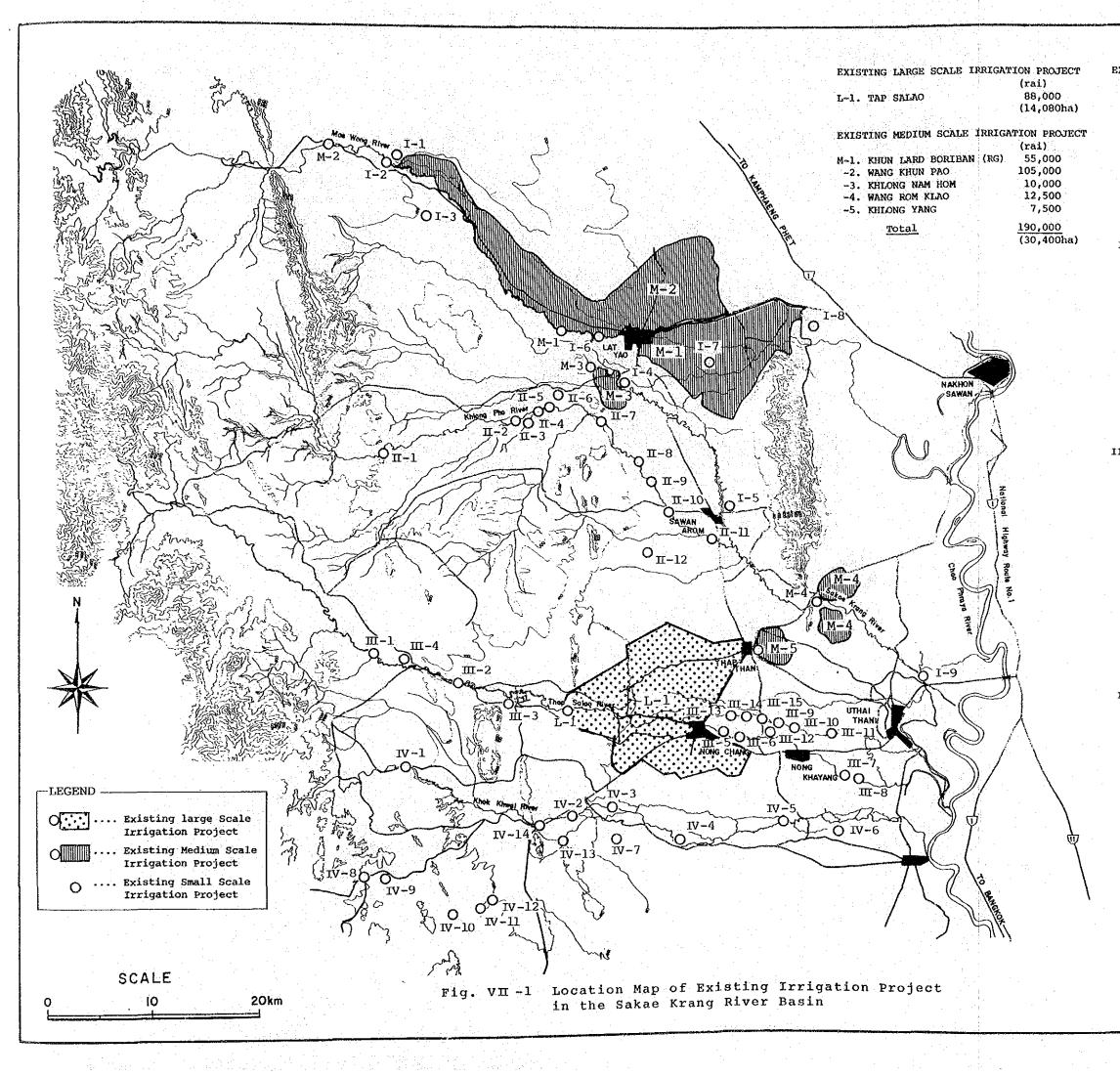
2. Irrigation System

Irrigation service area	7,360 ha
Main canal (concrete linning)	12.7 km
Lateral (concrete linning)	52.7 km
Sub-lateral	44.8 km
Related structures	
Turnout with Check	48 nos
Syphon	7 nos
Culvert	24 nos
Side Spillway	2 nos

3. Drainage System

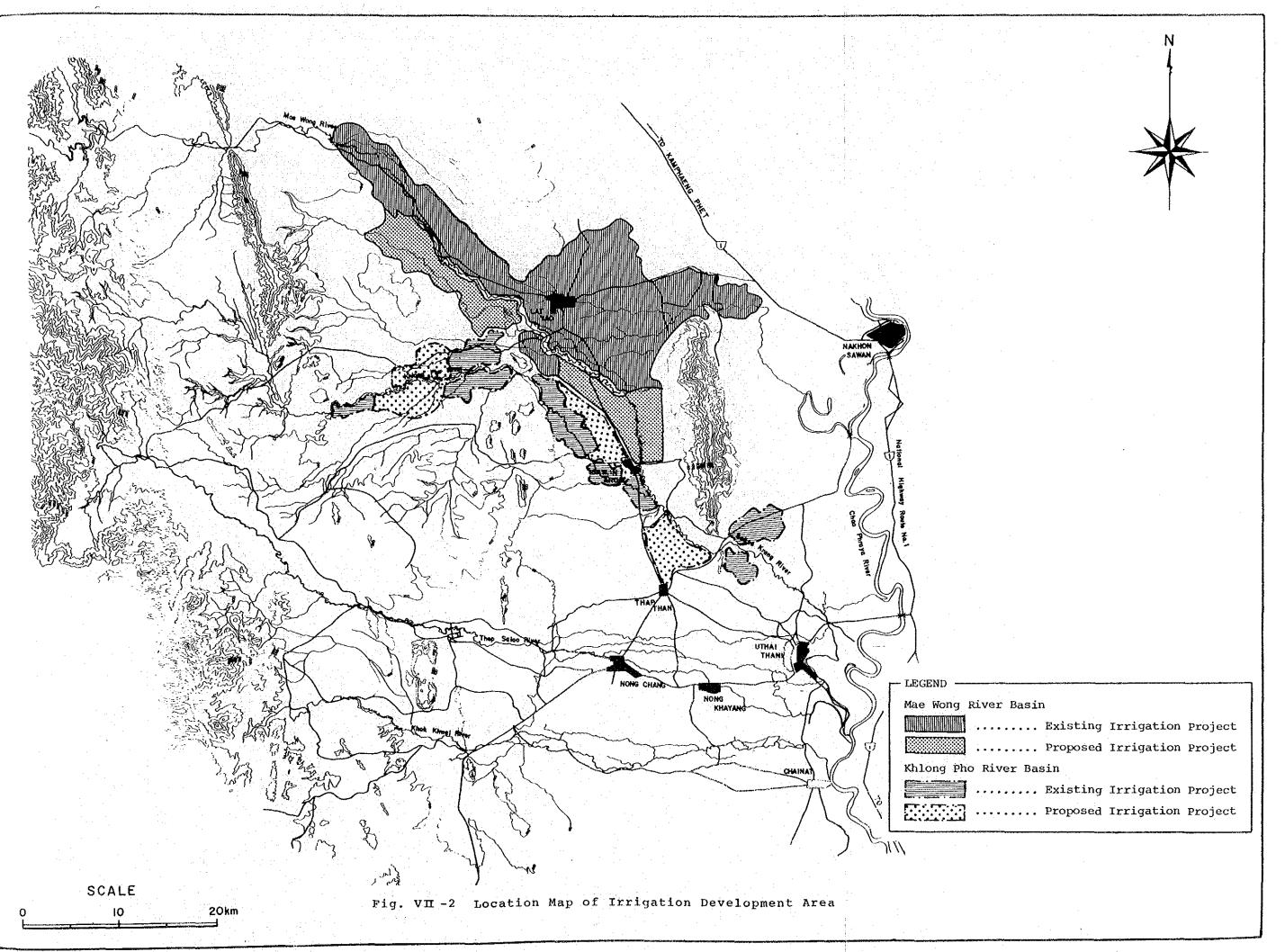
Lateral drain

4 km



and the state of the second	
XISTING SMALL SCALE IRRIGATION	
I. MAE WANG RIVER	(rai)
-1. BAN WANG NAM KAO (RG)	3,000
-2. KHLONG SAINGU. (RE)	10,000
-3. HUAI HIN LAB (RE)	3,000
-4. WANG MA (W)	26,000
-5. SAWANG A-ROM (W)	200
-6. LAN BAI DIEO (W)	4,000
-7. NONG YAO (W)	4,000
-8. WANG HIN PHOENG (W)	10,000
-9. HUAI PRA KHUN	300
Mark - 1	CO 1500
Total	60,500
	(9,680ha)
II. KHLONG PHO RIVER	
-1. BAN HUA KHAO DAENG (W)	4,000
-2. KHLONG PHO (RG)	4,000
-3. BAN KHLONG KHOI (W)	4,300
-4. THUNG MON (W)	5,000
-5. WANG HIN (W)	1,500
-6. HUAI YAI HEN (W)	
-7. MAP KAE (W)	6;000
	6,000
-8. KHAO KWANG THONG (W)	7,500
-9. KHLONG PHO (W)	4,000
-10. BAN WANG TA KIEN (W)	2,500
-11. NONG YAI DA (W)	8,000
-12. NONG KWAN KOOB (W)	1,000
Total	53,800
	(8,600ha)
II. THAP SALAO RIVER	
-1. PAK MUANG (RG)	3,500
-2. TAKRO (RG)	10,000
-3. LAK MET (RG)	21,500
-4. KHONG CHAI (W)	4,000
-5. BAN BO MAD (W)	2,000
-6. NONG BAN (W)	3,000
-7. HUAI WI (W)	3,000
-8. BAN MOK THAEO (W)	1,000
-9. DON KLOI (W)	5,000
-10. NONG PHANGKHA (W)	5,000
-11. THA PHO (W)	1,000
-12. BAN SUP PRA KON (RG)	500
-12. HAN SUP PRA NON (RG) -13. HUAI PRA CHAN (W)	
	3,000
-14. BAN KAO HIN CHON (RG) -15. HUAI ROB (RG)	2,000
-15. HUAI KOB (KG)	2,000
Total	66,500
	(10,640ha)
IV. KHOK KHWAI RIVER	
-1. PONG KHOI (W)	6,000
-2. BAN NONG KAE (RG)	2,000
~3. HUAI KHUN KAEW (W)	4,000
-4. WANG NAM KHAO (W)	10,000
-5. NORACHON (W)	25,000
-6. DONG PRAI (RG)	1,500
-7. BO LUK (W)	2,700
-8. HUAI LUK (RE)	800
-9. BAN KHLONG WAI (RE)	300
-10. BAN HIN NGUN (W)	4,500
-11. HUAI KHOT	2,000
-12. I TOOB (W)	4,000
-12. 1 100B (W)	10,000
-14. KAO TA NOD (W)	3,000
	-
Total	75,800
	(12,130ha)

VII-30



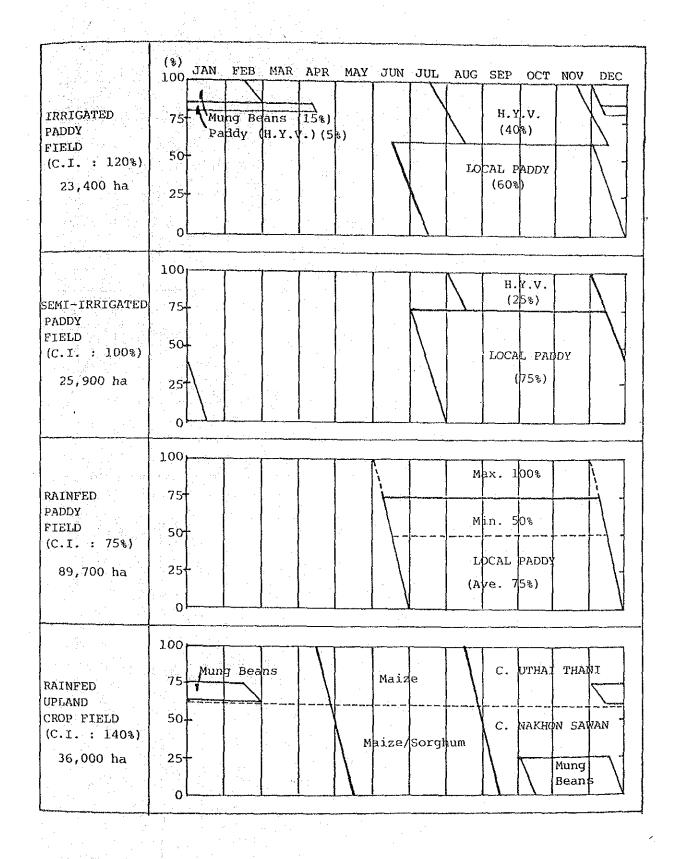
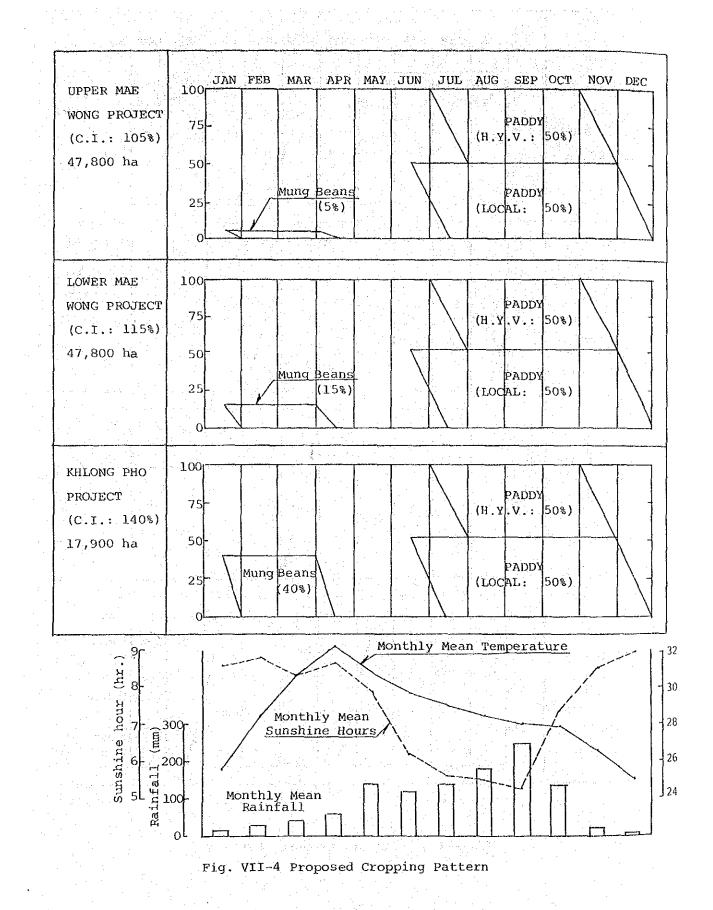
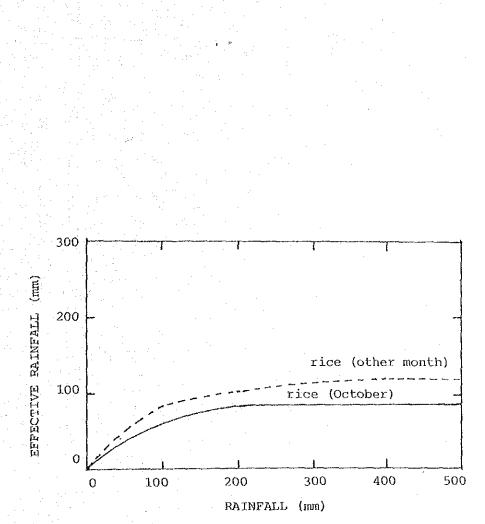
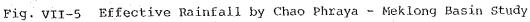
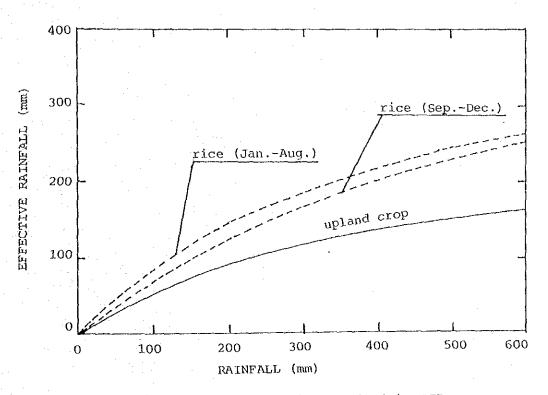


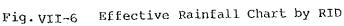
FIG. VII-3 Present Cropping Pattern

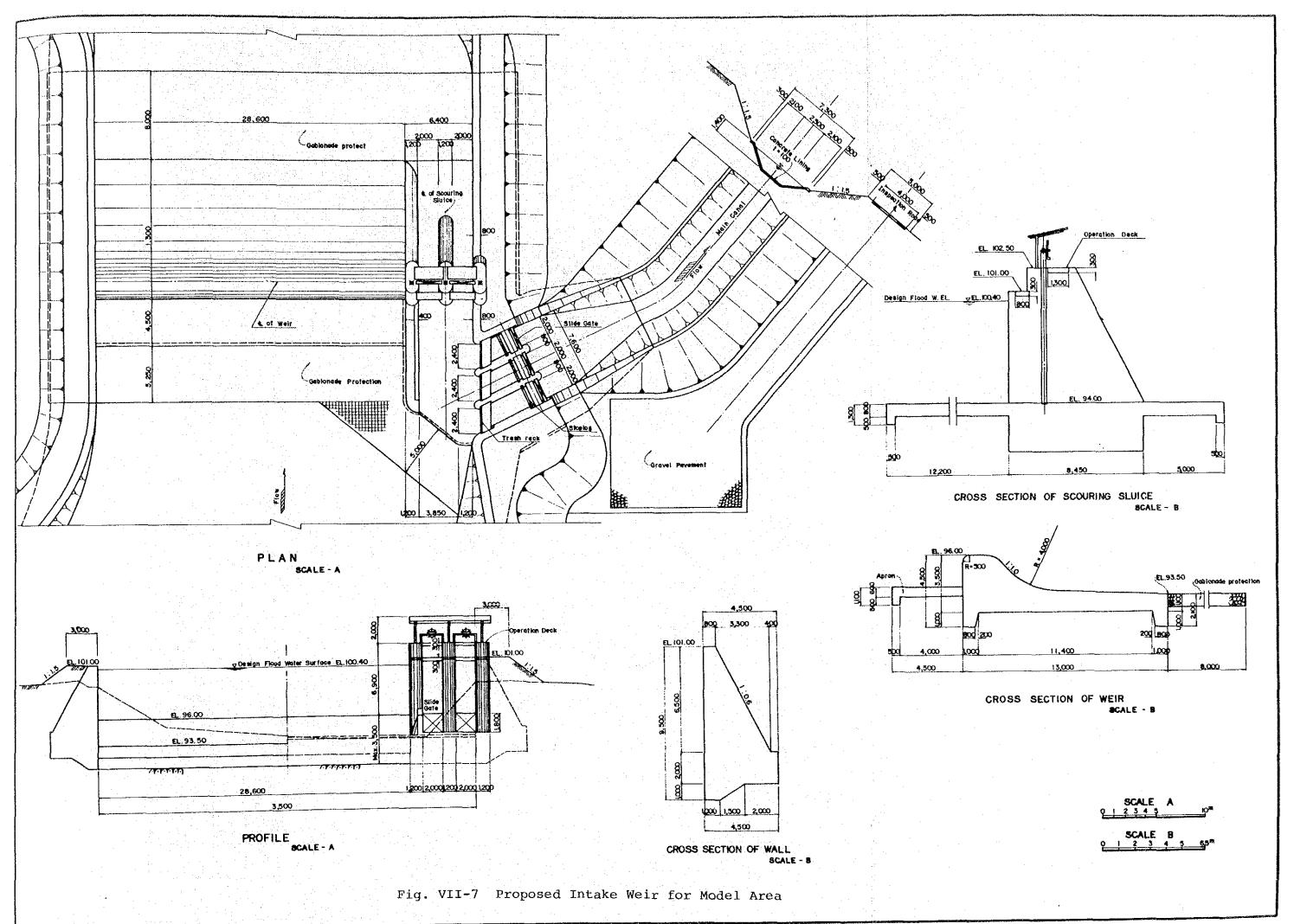






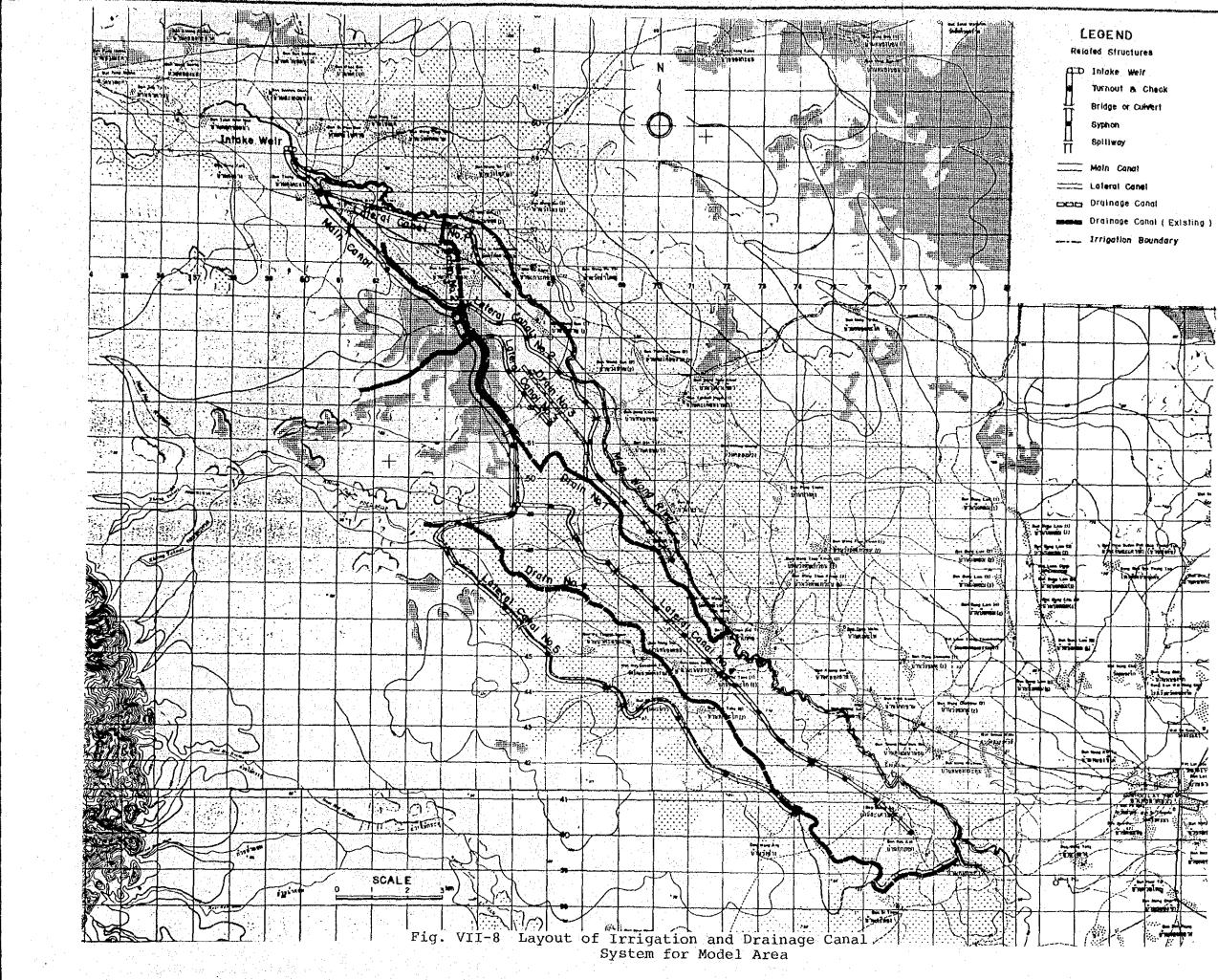




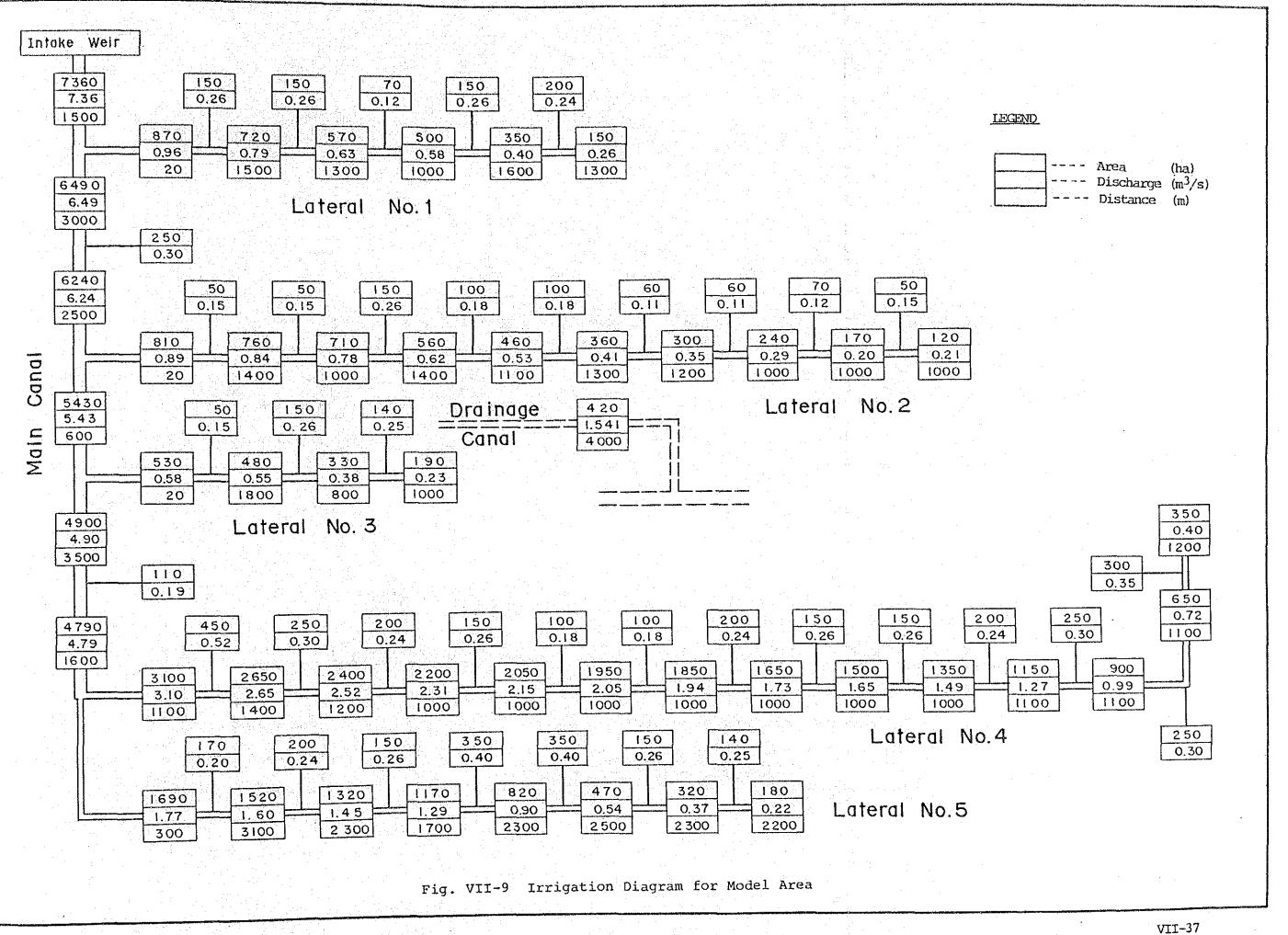


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VII-35



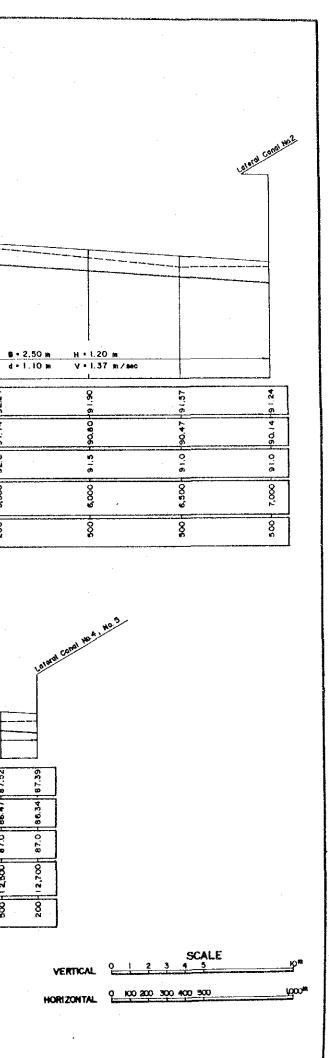
VII-36



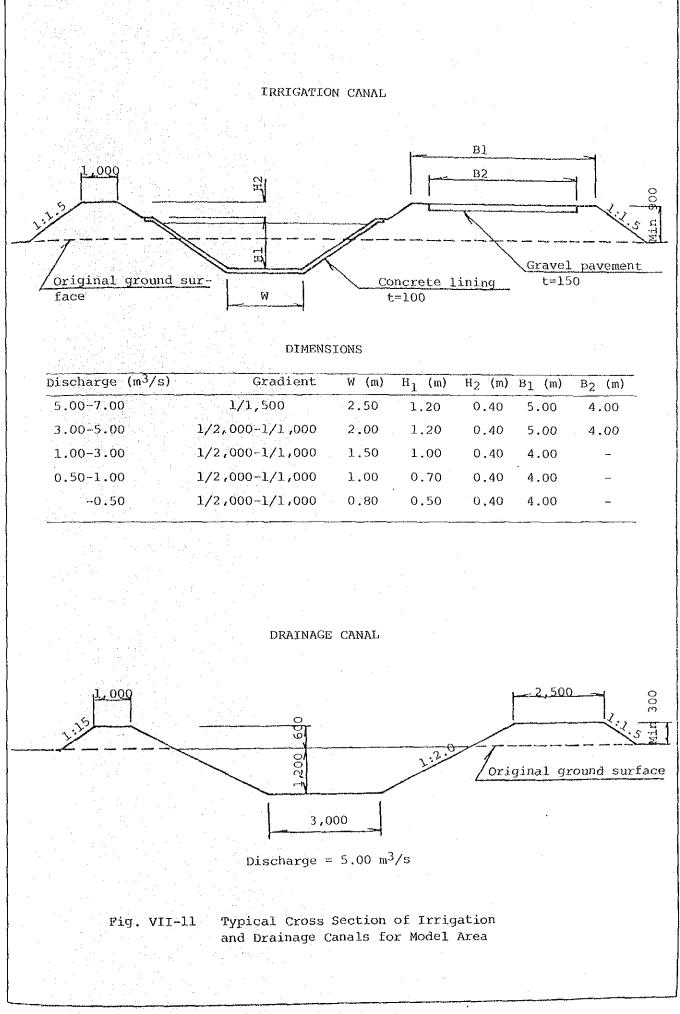
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											Q = 5.24 m ³ /sec	
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CANAL BASE ELEVATION	94.80		•	93.73	93.47		92.60	5 5 5 7	4 N 0	8	91.47	
GROUND SURFACE	0 0 66 9 6		6 20 8	0 Ø	50 10 10 10 10 10 10 10 10 10 10 10 10 10	C Č Č	C 4 6	8 3.1 0	O ri o		92.5	92.0
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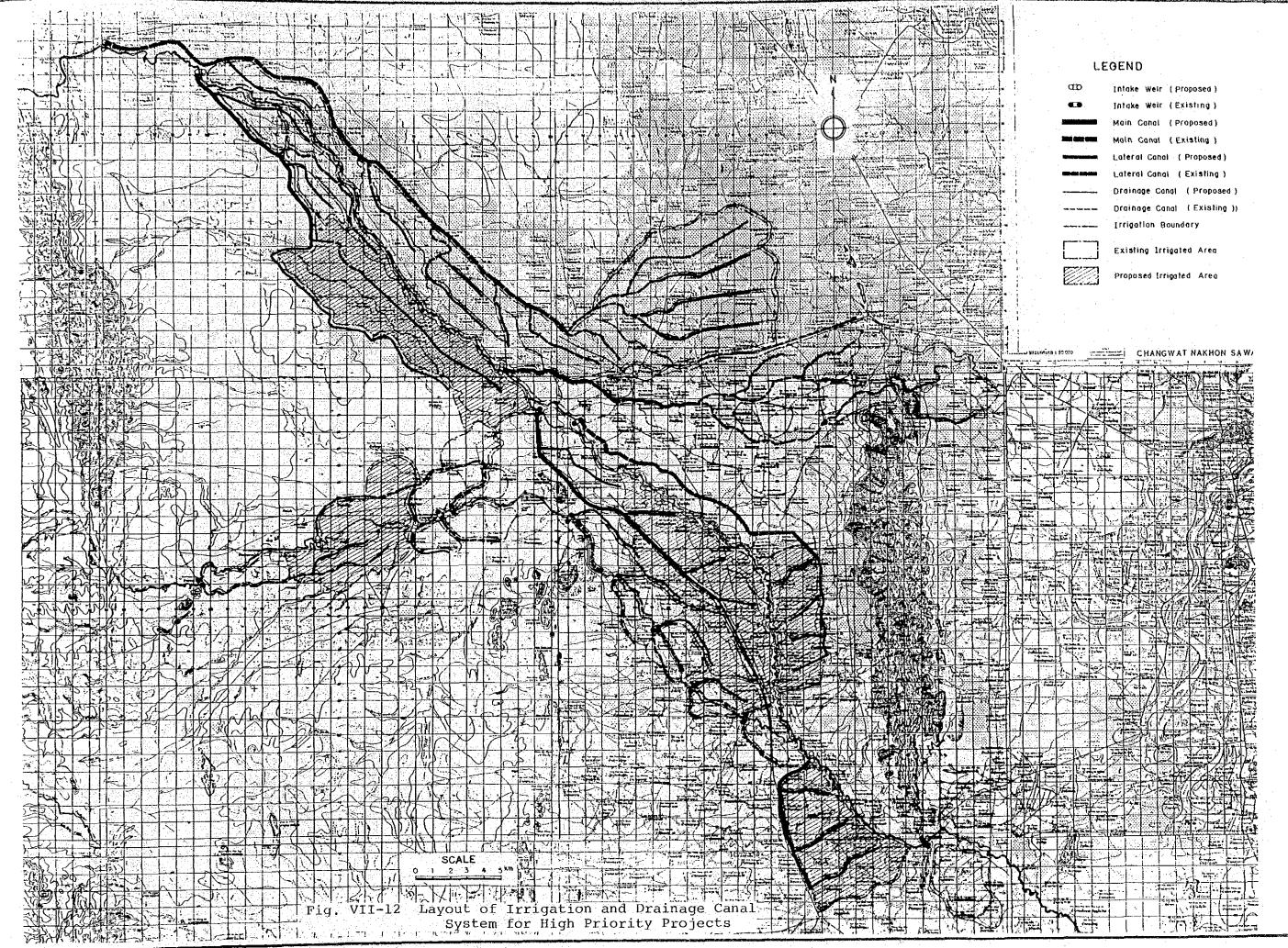
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Fig. VII-10 Profile of Main Canal for Model Area









αρ	Intake Weir (Proposed)
•	Intake Weir (Existing)
	Main Canal (Proposed)
State and	Maln Ganal (Existing)
	Lateral Canal (Proposed)
	Lateral Canal (Existing)
	Drainage Canal (Proposed)
	Drainage Canal (Existing)
	Irrigation Boundary
	Existing Irrigated Area
	Proposed Irrigated Area

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ANNEX VIII HYDROPOWER DEVELOPMENT POTENTIAL

ANNEX VIII

HYDROPOWER DEVELOPMENT POTENTIAL

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ANNEX VIII

HYDRO POWER DEVELOPMENT

1. ELECTRIC POWER DEMAND

1.1 Present Situation of Power Demand

In connection with power demand increase in Thailand, except for some years in which power demand lowered due to the oil crises during the 1970's, the average annual growth of power demand during the same period was recorded at such a high rate as more than 13%.

This growth rate was forced to be lowered due to the energy-saving policies of the Thai Government and hike in electricity tariffs but still showed over 6% on the average per annum.

It has proved that power demand increase in local cities and rural areas is more brisk than the Metropolitan area. In other words, an average annual increase rate of power demand in the Metropolitan area is 9% while local cities and rural areas enjoy an average annual growth rate of 16% during the period from 1975 through 1982.

As of September 1981, the electrification ratio of the Metropolitan area was recorded at 76% and that of local cities and rural areas 34%. The average electrification ratio of the entire territory of Thailand is estimated at around 40%. Accordingly, a large amount of power demand in local cities and rural areas could be anticipated with the progress of the electrification thereof.

The Thai Government is desirous of realizing industrization by utilization of natural gas to be exploited on the Siam Gulf in accordance with the fifth Economic and Social Five Year Development Plan (which commenced in October 1981). It is estimated that the annual growth rate of power demand up to the year of 1992 in Thailand will be at least 6% on the average in succession.

1.2 Power Demand Forecast

1.2.1 Demand forecast in whole Thailand

Power demand (load) forecast in Thailand has been worked out by the "Load Forecast Working Group for Power Tariff Study Sub-Committee" composed of representative of EGAT, MEA, PEA, NEA and NESDB.

The load forecast by them was performed by means of micro and macro methods. Under the micro method, they have estimated power demand in the respective supply areas of MEA and PEA based on the time-series of energy sales in various types of power supply. As for the supply areas of PEA, analyses were made definitely on correlation curves between per-capita GDP and energy consumption and perusal was also made into schemes for establishment of new industries and relevant projects, increase or decrease of the population, the progress of housing projects, etc.

For checking the appropriateness of the results of the study made by the above micro method, the macro method study was made on five (5) categories of power demands; residential (household) consumers, commercial consumers, industrial consumers, street lights and others. Then analyses were conducted on correlations between per-capita GDP and energy consumption thereby estimating the total values of power demand throughout the country up to the year of 1992.

As a result of comparisons of the results of load forecast between the micro and macro methods, it has proved that those results obtained by the two methods are almost approximate. Since the results of power demand (load) forecast are revised by the said Working Group every year based on actual records in the previous years, it can be said that such forecast fully reflects possible increase in power demand to a considerably accurate extent. (Refer to Fig. VIII-1)

1.2.2 Demand forecast in and around the study area

The supply area of PEA in which the site for the Sakae Krang River Basin Irrigation Project is located, belongs to Northern Region 3 of Thailand.

The above-mentioned Region has six (6) substations supplying electric power to seven (7) provinces. The expected supply areas of electric power to be obtained from this Project will be the present areas to which electric power is supplied at present through Nakhon Sawan Substation and Manoron Substation. Breakdown of the supply areas from the two substations after completion of the Project is expected to be as follows:

1) Nakhon Sawan Substation

Nakhon Sawan Province

- 1 A. Muang
- 2 A. Krok Phra
- 3 A. Lat Yao
- 4 A. Tha Tako

5

- A. Chumsaeng
- 6 A. Banphot Phisai
- 7 A. Nong Bua
- 8 A. Phaisali
- 9 A. Khao Leo
- 10 T. Kaho Thong
- 11 Phayuha Khiri

Kamphaeng Phet Province

1 A. Khanu Woralaksaburi

2) Manorom Substation

- 1 A. Muang
- 2 A. Manorom
- 3 A. Sankhaburi
- 4 A. Sanphaya
- 5 A. Wat Sing
- 6 A. Hanka

Uthai Thani Province

1 A. Muang

3

- 2 A. Nong chang
 - A. Nong Khayang
- 4 A. Thap Than
- 5 A. Sawang Arom
- 6 A. Ban Rai
- 7 A. Lan Sak

Nakhon Sawan Province

- 1 A. Phayuha Khiri
- 2 T. Nong Pho
- 3 A. Takhli
- 4 T. Hua Wai

The values of power demand (load) forecast prepared by PEA have been compiled for each Province. The said forecast covering the period from 1984 up to 1992 is made by reference to each category of actual energy consumption recorded during the past ten (10) years from 1974 through 1983.

The results of the power demand forecast made for each of Nakhon Sawan, Chai Nat and Uthani Provinces are as shown in Figures VIII-2 and VIII-3. As may be seen from Tables VIII-1 to VIII-3, energy consumption in Nakhon Sawan Province is larger than that in the two other Provinces, and the quantity of energy consumption per household in Nakhon Sawan Province is larger than that in the two other Provinces, and the quantity of energy consumption per household in Hakhon Sawan Province is approximately 150 kWh, 100 kWh and 80 kWh.

The actual records of energy consumption for one year from October 1983 through September 1984 (See Tables VIII-4 and VIII-6) indicate that there are some disparities in energy consumption between the rainy season and dry season.

According to brewkdown of Province-wise energy consumption as given n Table VIII-7 to VIII-9, energy consumption for residential use in Nakhon Sawan Province accounts for some 50%, 58.1% and 73.4%, respectively, of the total energy consumption in the three Provinces occupies the largest portion of the total energy consumption.

As for energy consumption for commercial and industrial use, Nakhon Sawan Province is a hub of economic activities in this Region and has larger energy consumption in the said categories, compared with the two other Provinces.

The trend of increase in the number of consumers are as given in Table VIII-10 to VIII-12, proving that energy consumption for commercial and industrial use in the two Provinces other than Nakhon Sawan Province was not so larger in quantity from 1974 through 1983 while Nakhon Sawan Province has been making a rapid increase in the amount of energy consumption since 1977.

2. ELECTRIC POWER DEVELOPMENT PLAN

2.1 Necessities for Development

Economic growth of Thailand during the 1970's showed a rise of 7.4%. Of developing countries in Asia, this country takes pride in vigorous economic advancement immediately after Hong Kong, Korea, Taiwan and Singapore. Economic growth in the industrial sector of Thailand, among others, has almost doubled that in the 1960's.

Power demand as of 1982 is recorded at 17,500 GWh. As stated in Section 1.2 "Electric Power Demand Forecast", the increase in peak demand is to be gradually lowered down from an annual growth rate of 14% in 1983 to that of 6.5% in 1965. Thereafter an annual growth rate of 6% is estimated to continue.

2,900 MW and 17,500 GWh are actual figures as power demand as of 1982 and such demand is estimated to become two-fold or more in 1991. From 1982 onward power demand increase per year will reach a level of 400 to 500 MW and 2,400 to 3,200 GWh.

At present oil-fired power plants meet 65% of the total power demand in Thailand. As viewed from the whole of energies, the country relies upon oil by 78% for satisfying the requirements. Therefore, the Government of Thailand intends to develop alternative energies such as natural gas, lignite, hydro power and so forth on a large scale thereby ensuring her economic stability in the future. Accordingly, it is desired that development of hydro power plants be made by effective utilization of irrigation water to be obtained upon completion of the Sakae Krang River Basin Irrigation Project.

2.2 Hydro Power Development Plant

2.2.1 Basic plan

The Sakae Krang River Basin Irrigation Project is a water resources development scheme which mainly aims at realization of irrigation development. It is, therefore, essential that the hydro power development plan be scrutinized on the basis of reservoir operation which will depend on the said irrigation development plan. In other words, the above-mentioned

hydro power development plan may be counted as the so-called "generation scheme incidental to irrigation water". Necessary studies have been made as follows in connection with the upper and lower stream sites of the Mae Wong River and the Khlong Pro river to which high priorities are given among the components of the Sakae Krang River Basin Irrigation Project.

(a) Study on maximum discharge

The maximum discharge has been determined based on the quantity of the release water as given in Table VIII-13, which was obtained from the optimal water balance. Four (4) cases were selected from among the monthly average discharge and duration curves of water to be released from the respective dam (covering 28 years from 1954 through 1981) at the Upper Mae Wong site, Lower Mae Wong site and Khlong Pho site.

(b) Rated head

The rated head has been obtained assuming that the standard water level (rated head) is to be the average water level of reservoir operation rule of each dam (which has been proposed to have the optimal scale) covering 28 years from 1954 through 1981.

(c) Estimate of construction cost

The construction cost has been estimated by reference to costs incurred in construction of other hydro power development projects with similar scale in Thailand.

(d) Benefits

The respective power plants at the proposed sites of the Project will provide firm power of null. According to a figure adopted by EGAT at the planning stage of projects, kWh benefit has been assumed to be #1 per kWh.

(e) Annual expenditures

The annual expenditures have been assumed to be 2% of the construction cost of the power facilities, according to a figure adopted by EGAT at the planning stage of projects.

2.2.2 Outline of hydro power development plan

The outcome of the studies as described in the Basic Plan is as shown in Table VIII-14. Table VIII-15 gives the results of the case study. Table VIII-1 RECORD OF NAKHON SAWAN ELECTRIC ENERGY CONSUMPTION SEPTEMBER, 1984

Names of Districts	No. of Consumers	Energy Consumption (kWh)	Revenue (¥)	Average Price (\$/kWh)	Per Capita Consumption (kWh)
Nakhon Sawan	22,096	6,626,809	11,736,795.27	1.77	299.91
Ban Nong Ben	3,281	178,246	247,888.63	1.39	54.33
Krok Phra	1,640	89,468	122,289.83	1.37	54.55
Ban Tak Eenleun	1,403	86,735	120,225.15	1.39	54.69
Lad Yao	6,014	841,529	1,524,222.47	1.81	139.93
Tha Tako	3,590	279,962	442,480.81	1.58	77.98
Ban Huo Tanon	2,328	93,187	118,159.53	1.27	40.03
Chun Saeng	5,251	477,160	730,470.63	.1.53	90.87
Nong Buo	4,155	249,243	375,174.18	1.34	59.99
Thap Krit	1,219	66,960	92,199.48	1.38	54.93
Ban Pot Phisai	3,841	233,047	323,697.14	1.39	60.67
Paisali	2,584	139,633	200,503.10	1.44	.54.04
Kao Leo	2,159	123,605	170,053.53	1.38	57.25
Ban Maha Pho	511	24,803	31,309.33	1.26	48.54
Phayuhakiri	4,253	463,041	793,410.88	1.71	108.87
Ban Khao Thong	1,102	51,101	69,193.64	1.35	- 46.37
Ban Tha Nam Oy	1,205	124,737	206,309.05	1.65	103.52
Nong Pho	869	43,644	58,955.99	1.35	50.22
Ta Kli	7,754	1,726,604	2,940,027.92	1.70	222.67
Ban Chong Khae	2,467	128,690	182,369.86	1.42	52.16
Ban Chan Sen	678	44,347	63,147.02	1.42	65.41
Ban Huo Sai	920	50,071	66,508.81	1.33	54.43
Tak Fa	2,105	183,758	282,209.74	1.54	87.30
Takro	1,190	27,724	32,419.64	1.17	23.30
Total	82,615	12,354,104	20,930,021.29	1.69	149.54

VIII-7

Names of Districts	No. of Consumers	Energy Consumption (kWh)	Revenue (¥)	Average Price (B/kWh)	Per Capita Consumption (kWh)
Chainat	10,375	1,310,174	2,117,628.50	1.62	126.28
Mano Rom	3,606	740,068	972,072.17	1.31	205.23
Sankaburi	3,620	205,589	287,234.25	1.40	56.79
Ban Huai Krot	1,167	54,747	75,417.03	1.38	46.91
Sapaya	1,370	66,298	86,491.84	1.30	48,39
Ban Pho Narg Darm	2,737	138,726	183,742.02	1.32	50.69
Hun Kha	3,554	285,450	459,249.44	1.61	80.32
Ban Neon Kham	1,104	40,002	50,980.24	1.27	36.23
Ban Huai Ngu	1,559	83,913	115,411.84	1.38	53.82
Total	29,092	2,924,967	4,348,227.33	1.49	100.54

Table VIII-2 RECORD OF CHAI NAT ELECTRIC ENERGY CONSUMPTION SEPTEMBER, 1984

es es s

Table VIII-3 RECORD OF UTAL THANL ELECTRIC ENERGY CONSUMPTION SEPTEMBER, 1984

Names of Districts	No. of Consumers	Energy Consumption (kWh)	Revenue (¥)	Average Price (\$/kWh)	Per Capita Consumption (kWh)
Utai Thani	6,191	913,555	1,550,461.27	1.70	147,56
Nong Chang	2,727	160,207	233,033.62	1.45	58.75
Ban Khao Nang Grat	957	58,055	85,480.22	1.47	60.66
Nong Kha Yang	1,411	55,200	71,609.17	. 1.30	39.12
Thap Than	2,566	106,815	141,549.30	1.33	41.63
Ban Rai	829	49,269	70,963.65	1.44	59.43
Ban Pha Rung	546	47,762	72,416.18	1,52	87.48
Lan Sak	920	68,888	101,750.67	1.48	74.88
Wat Sing	2,696	150,676	216,170.07	1.43	55.89
Sawang Arom	1,000	40,830	55,348.39	1.36	40.83
Talvt Khu	1,298	50,437	66,337.23	1.32	38.86
Total	21,141	1,701,696	2,665,119.79	1.57	80.49

VIII-9

Month	No. of Consumers	Energy Consumption (kWh)	Revenue (B)	Average Price (B/kWh)	Per Capita Consumption (kWh)		
Oct. 1983	77,609	10,680,758	17,966,216.79	1.68	137.62		
Nov. 1983	78,074	10,262,265	17,213,363.24	1.68	131.44		
Dec. 1983	78,335	9,827,132	16,300,610,70	1.66	125.45		
Jan. 1984	78,808	9,776,661	16,378,449.31	1.68	124.06		
Feb. 1984	79,489	10,661,153	17,866,760.16	1.68	134.12		
Mar. 1984	79,827	11,573,129	19,524,609.14	1.69	144.98		
Apr. 1984	80,465	12,601,110	21,311,126.72	1.69	156.60		
May 1984	81,062	12,954,217	21,728,078	1.68	159.81		
June 1984	81,657	12,855,424	17,618,518.92	1.37	157.43		
July 1984	82,135	12,136,649	20,480,757.36	1.69	147.76		
Aug. 1984	93,508	12,001,097	20,169,675.40	1.68	128.34		
Sep. 1984	82,615	12,354,104	20,930,021.29	1.69	149.54		
Total	973,584	137,683,699	227,488,187.53	1.65	141.42		

Table VIII-4 RECORD OF NAKHON SAWAN ELECTRIC ENERGY CONSUMPTION FROM OCT. 1983 TO SEP . 1984

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Month	No. of Consumers	Energy Consumption (kWh)	Revenue (ß)	Average Price (B/kWh)	Per Capita Consumption (kWh)
Oct. 1983	26,670	2,296,243	3,645,872.09	1.59	86.10
Nov. 1983	26,773	2,343,722	3,615,239.06	1.54	87.54
Dec. 1983	26,948	2,110,086	3,228,254.84	1,53	78.30
Jan. 1984	27,167	1,956,883	2,948,268.61	1.51	72.03
Feb. 1984	27,306	2,074,947	3,171,914.70	1.53	75.99
Mar. 1984	27,556	2,565,158	3,942,552.96	1.54	93.10
Apr. 1984	27,734	2,670,811	4,127,502.24	1.55	96.30
May 1984	27,904	2,643,891	4,058,412.28	1.54	94.75
June 1984	28,227	2,695,391	4,172,862.67	1.55	95.49
July 1984	28,077	2,575,555	3,965,454.16	1.54	91.73
Aug. 1984	28,709	2,606,428	3,934,090.52	1.51	90.79
Sep. 1984	29,092	2,924,967	4,358,229.33	1.49	100.54
Total	332,163	29,464,082	45,168,653.46	1.53	88.70

Table VIII-5 RECORD OF CHAINAT ELECTRIC ENERGY CONSUMPTION FROM OCT. 1983 to SEP. 1984

VIII-11

 	Month	No. of Consumers	Energy Consumption (kWh)	Revenue (ع)	Average Price (B/kWh)	Per Capita Consumption (kWh)	
	Oct. 1983	19,113	1,403,035	2,156,968.07	1.54	73.41	
	Nov. 1983	19,268	1,367,447	2,078,531.94	1.52	70.97	
	Dec. 1983	19,364	1,241,029	2,007,420.05	1.62	64.09	
	Jan. 1984	19,435	1,231,881	1,827,091.07	1.48	63.38	
	Feb. 1984	19,545	1,374,123	2,058,117.85	1.50	70.31	
	Mar. 1984	19,759	1,443,235	2,178,407.45	1.51	73.04	
- - -	Apr. 1984	20,024	1,611,278	2,484,933.58	1.54	80.47	
	May 1984	20,260	1,652,861	2,574,394.67	1.56	81.58	
	June 1984	20,374	1,594,841	2,508,927.23	1.57	78.28	
	July 1984	20,653	1,616,580	2,548,843.71	1.58	78.27	
	Aug. 1984	20,812	1,591,299	2,463,520.45	1.55	76.46	
•	Sep. 1984	21,141	1,701,696	2,665,119.79	1.57	80.49	
	Total	239,748	17,829,305	27,552,276.46	1.55	74.37	

Table VIII-6 RECORD OF UTAI THANI ELECTRIC ENERGY CONSUMPTION FROM OCT, 1983 to SEP. 1984 Table VIII-7 ENERGY SALES: NAKHON SAWAN

FISCAL YEAR 1974 \sim 1983

308,768 2,998,415 551,660 272,865 1,863,914 552,717 636,225 736,289 288,911 1,886,737 (kwh) Charge Free ЧJ 75,166,091 88,226,853 64,511,235 59,764,186 62,909,344 94,586,346 123,316,910 109,271,193 62,593,384 95,250,041 Total 27,127 131,546 401,274 496,208 30,892 84,033 160,342 271,262 352,156 30,604 porary Ten-5,850 186,900 17,600 2,302,073 500 6,318 112,715 1,151,260 941,400 924,200 Pumping culture Agri-Government 2,674,853 Education Hospital, and Insti Service tute of Health 2,854,830 909,985 1,331,120 1,211,976 1,207,105 2,793,020 1,298,766 Industry 1,023,851 2,266,042 1,250,157 Large 12,109,323 14,276,704 14,334,319 14,785,900 12,546,360 I5,360,802 16,279,983 15,743,461 17,780,480 10,762,597 Industry Small 10,469,180 14,382,797 11,779,191 13,887,484 14,942,026 16,155,764 13,943,528 16,575,983 12,219,251 15,314,253 Business Large 22,887,536 14,509,028 16,324,545 20,707,855 | 19,240,619 19,932,831 19,246,386 21,223,716 19,324,057 20,252,115 Business Small 26,625,220 9,599,490 11,428,299 36,932,409 8,762,558 33,252,288 54,674,017 43,542;392 42,375,699 62,421,882 Residential Street Light-ing 172,429 174,268 209,792 243,146 213,810 206,887 235,894 260,059 181,354 329,651 1974 1975 1976 1.977 1978 1979 1980 1981 1982 1983 Year

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Table VIII-8 ENERGY SALES: CHAI NAT

FISCAL YEAR 1974 ~ 1983

к. 11.	•										
(kwh)	Free of Charge	115,034	121,686	153,731	181,752	190,352	172,358	162,910	160,746	180,925	192,510
	Total	6,001,359	8,619,424	10,093,327	12,300,975	13,648,997	19,131,055	21,295,181	23,514,954	26,847,020	29,118,229
	Tem- porary	13,228	23,792	31,203	18,304	21,499	34,996	118,287	50,379	67,559	93,737
	Agrí- cultúre Pumping	648,987	713,685	761,222	606,618	I,940,288	2,302,073	1,759,305	I,009,416	1,766,316	2,209,343
	Government Hospital, Health Service and Insti- tute of Education										736,733
	Large Industry	338, 278	645,674	863,810	961,083	583,040	1,514,348	475,042	2,108,604	1,263,516	1,418,568
	Small Industry	442,428	844,467	1,129,763	1,256,986	762,548	1,980,592	2,554,752	2,757,811	2,544,922	2,984,327
	Large Business	190,019	362,690	485,222	539,864	327,507	850,645	1,114,635	1,184,453	2,503,224	1,585,416
	Small Business	607,108	1,158,792	1,550,280	1,724,857	1,046,381	2,717,801	4,050,199	3,784,313	3,715,182	3,016,064
- - -	Residen- tial	3,685,503	4,772,424	5,182,796	7,094,987	8,849,229	9,602,254	11,100,017	12,492,590	14,835,665	16,920,924
	Street Light- ing	75,808	97,900	89,031	98,276	118,505	128,346	122,944	127,388	150,636	153,117
4. 	Year	1974	1975	926I	1977	1978	1979	1980	1981	1982	1983

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