Table IV-13 Selection of Irrigation Development Projects (1/2)

1	Pakeong Xe Pan A.Makchan Gravity Lower Ne Pian Gravity Lower Wakchan Lower Makchan Lower Makchan Xe Katan Xe Katan Xe Katan Xe Katan A.Madle Namtang H.Chuang	750 A70 A70	Area (Ha) Dutside of Study area	Easy access for water operation	Positive activities of water users association	easy approch of agriculture support syst.	Advantageous approach for demonstration	amper page	3	of Areas	Projects
Notice National	M. Makchan H. Makchan Cravity Upper Makchan H. Namiang H. Namiang H. Namiang K. Katum Cravity Middle Namiang M. Cravity Thonvay M. Chuang H. Chuang H. Chuang H. Chuang H. Cravity Thonvay Cravity Thonvay Cravity Thonvay Cravity Thonvay Cravity Thonvay Cravity Thonvay	750									
	Ke Plan Gravity Lower Ne Plan Gravity Upper Makchar Gravity Upper Makchar Katam Xe Gravity Thonvay Xe Gravity Upper Tapoung Xe Gravity Upper Tapoung	750								-	
Common Lower No. No. 1 Common Lower No. No. No. 1 Common Lower	H.Makchan H.Makchan Lower Makchan Lower Makchan Lower Makchan Lower Makchan K.Katam Xe Katam Xe Katam Xe Katam Xe Katam Xe Katam Anddie Nemtan H.Chuang	750									<
Notation Notation	H.Makchan Lower Makchan Lower Makchan H.Namtang K. Katam Cravity Thonvay Thong Hong H.Chuang H.Chuang H.Chuang H.Chuang H.Tapoung	340	•	3	2	.,		,			
NAMESTON ACCOUNT Control Con	H. Makchan Lower Makchan Lower Makchan H. Namtang K. Katam Cravity Thonvay Thong Hong H.Chuang H.Chuang H.Chuang H.Chuang H.Tapoung H.Tapoung H.Tapoung H.Tapoung H.Tapoung Middle Tapoung Middle Tapoung Middle Tapoung	340									
Notice Control Department March March	Cravity Cipper Makchar Lower Makchar Cravity Middle Namian Xe Katam Cravity Thonyay Thong Hong H.Chuang Middle Xe Kata Middle Xe Kata Cravity Thonyay Cravity Upper Tapoun Gravity Upper Tapoun Gravity Upper Tapoun	203				F	3	3	13		٥
National Section National Se	H.Namiang H.Namiang Xe Katan Ceravity Thonyay Thong Hong Middle Xe Kat Middle Xe Kat Ceravity Thonyay Thonyay Thonyay Thonyay Ceravity Thonyay Gravity Upper Tapoun	3			6	6.	3	C 2	11		٥
Note	H.Namtang Gravity Middle Namtan Xe Katam Gravity Thonyay Thong Hong H.Chuang H.Chuang Gravity Thonyay Gravity Thonyay Gravity Upper Tapoung Gravity Upper Tapoung Gravity Upper Tapoung								-		
Courty Acide (National Acide	Achain Xe Katan Cravity Thonyay Thong Hong Middle Xe Kata Middle Xe Kata Middle Xe Kata Achain H.Chuang Cravity Thonyay Cravity Upper Tapoung Cravity Upper Tapoung Cravity Upper Tapoung										
K.C. Steam	Xe Katam Gravity Thonyay Thong Hong Middle Xe Kat Middle Xe Kat Gravity Thonyay Gravity Thonyay Gravity Upper Tapoun	265		3	2	2	3	2	ដ		٥
Yester Y	Xe Katam Gravity Thonyay Thong Hong Middle Xe Kat Middle Xe Kat Cravity Thonyay Gravity Thonyay H.Tapoung Gravity Upper Tapoung Gravity Upper Tapoung										
Convolty Tribungs 100 2 3 2 2 2 3 4 Hollands Thought from 50 2 3 3 2 1 2 1 Hollands Thought from 50 2 3 3 2 1 9 1 Hollands Thought from 50 3 2 2 2 3 1 9 1 Hondall from 50 3 3 2 2 2 3 3 1 1 9 Hondall from 50 3 3 3 3 3 3 3 3 3 3 3 Hondall from 40 3 3 3 3 3 3 3 3 3 3 3 Honday Pale 3 3 3 3 3 3 3 3 3 Gravier Hone 4 4	Crowity Thonvay Thong Hong Middle Xe Kate Middle Xe Kate Crowity Thonvay Gravity Upper Tapoung Gravity Upper Tapoung Gravity Upper Tapoung					-					
Microsoft	Thong Hong Middle Xe Kate Middle Xe Kate Gravity Thonvay Gravity Upper Tapoung Gravity Upper Tapoung Anddle Tapoung	100		2	3	2	2	2	= 6	Existing Project	
Michael No. Nation Michael	Middle Xe Kati H.Chuang Gravity Thorivay Laongam H.Tapoung Gravity Upper Tapoung Anddle Tapoung	92		72	3	c2			» 2	Existing Project	,
H.Change Convey Theory NO Convey Theory N	H.Chuang Gravity Thorway Laongam H.Tayosung Gravity Upper Tapoung Middle Tapoun	029		3	т.	2	3		4		
HACOMENION Transvey NG Consists Transvey NG Consists Transvery NG Consists Transvery NG Consists Transverse	H.Chumps Gravity Thorrow Laongam H.Tapoung Gravity Upper Tapoung Middle Tapoun										
Conveyt Traversity Model Tra	Cravity Thorvay Laongan H.Tspoung Gravity UpperTapoun				,		6		•	Existing Project	
Hydrony Hydro Theory Hydro Charter Hydrony	Laongam H.Tapoung Gravity	æ			7	,					
H. Changer The Changer T	Laongam H.Tapoung Gravity								-		
H. Changer Conveyty Upper Tayloring System Conveyty Upper Tayloring System System	H. Tapoung Gravity										
Middle Laptoning 450 130	אַאַאַכּייַ	\$		-	2	2	3		11	-	٥
Microsoft Special Control (Libert Chapter) Microsoft Special C		Ş			1,1	2	3	£	13		٥
H.Zegebox New Areta 7,000 8,000 2 2 2 1 1 9		3 5			11		3	: 2	1.2		٥
H.Zepkov Upper Kapibeu U.100 S S S S S S S S S		38	000 8		2	c.	2		0		
H. Kapher H. K		-									
KPAlia Convery Upper Champia 2x0 3 3 3 3 13 H/Champia Convery Palia 2x0 1,100 3 2 2 3 3 13 Convery Upper Champia 1,500 1,100 3 2 2 3 3 13 Kinder Champia 1,500 1,100 3 2 2 3 3 13 Kinder Champia 1,500 1,100 3 2 2 3 13 Microst Champia 1,500 1,100 3 2 2 3 13 Alianda 1,000 3 2 2 2 1 9 Alianda 1,000 3 2 2 2 3 13 KTOPA Locaty 1,000 3 2 2 2 1 13 Accounty Microst Champia 1,000 3 2 2 2 1 1	H.Kapheu								;		<
H Palai Cinnerty House Palai 240 3 3 3 3 3 3 13 2 2 13		1,100		3	3	3	3	m	C		,
H, Palais Generic Floating 2-40 3 2 2 2 13 H, Changing Tool 1,100 3 2 2 2 3 1,10 Convicy Uspeer Changing 1,500 1,100 3 2 2 3 1,2 1,2 New Area 0 1,500 2 2 2 3 1,2											
H.Champi Convicy Notary Palais 240						·	ſ	•		Existing Project	
H.Champi Convey. Upper Champi 770 1,100 3 2 2 3 3 13 10 Salvan Lower Champi 1,500 1,100 3 2 2 3 2 13 10 New Actas Lower Champi 1,500 2 2 2 3 3 10 Na Ser Solvan Security 500 2 2 2 3 3 3 13 Activity Lower Actas 1,500 3 2 2 2 3 3 13 Activity Upper Thom 640 3 2 2 2 2 10 Conviry Upper Tay- Un 350 3 3 2 2 2 11 Middle Lamphan 250 2,560 3 2 2 2 11 11 Activity B Vorong Khhm 20 3 2 2 2 1 11	Cravity	92		3	8	7	7				
Canvity Upper Champs 730 1,100 3 2 2 3 3 13 15											
Cover Champi 1,500 1,100 3 2 2 3 10 10 10 1,500 1,100 2 1,100 1,500 2 2 2 1 1 1 3 1 10 10 1,500 1,500 2 2 2 2 1 1,500 1,500 2 2 2 2 3 3 1,3	Charity	05.7		3	2	2	3		13		۰
Schwan Dev Area 0 1,500 2 2 1 3 10 Schwan Schwan Schwan 2 2 2 1 9 Xe Set Xe Set 50 2 2 2 1 9 Action Yosen Xe Set 1,800 3 2 2 2 1 9 H.Thon Gravity Upper Thon 660 3 2 2 3 3 13 H.Tay-Un New Area 2.500 3 3 3 3 3 2 2 2 10 Middle Lamphan 150 3.50 3 3 2 2 2 11 Middle Lamphan 250 2,660 3 3 2 2 2 11 Middle Lamphan 40 3 2 3 2 2 11 Convity B Victorig Kham 40 3 2 3 2 <t< td=""><td></td><td>2,500</td><td>1.100</td><td>3</td><td>2</td><td>2</td><td>3</td><td>2</td><td>72</td><td>-</td><td>0</td></t<>		2,500	1.100	3	2	2	3	2	72	-	0
National Solution Nati		٥	1 300	2	. 2	2	-	2	10		
Xic Set Xic Set 2 2 2 2 1 9 Coravity Would Set 1,800 3 2 2 2 3 13 H.Thon Conver Xe Set 1,800 3 2 2 3 3 13 H.Thon Gravity Upper Thon 640 3 2 2 3 3 13 Gravity Upper Thon Line 3 3 2 2 2 2 10 H.Tay-Un Middle Laphan 250 2,660 3 3 2 2 2 11 H.Laha Middle Laphan 40 3 2 2 2 2 11 Gravity B.Vioang Kham 40 3 2 3 2 11 11 H.Laha Gravity B.Vioang Kham 40 3 2 3 2 11 11 H.Laha 40 3 2 3 2 11 11 <				_							
Xe Set Xe Set Xe Set Xe Set 3 2 2 2 2 1 9 Convicy Model Lamphan Set 3 2 2 2 3 3 13 H.Thon Gravity Upper Thon Set Gravity Upper Thon Set 3 2 2 3 3 13 H.Tay- Un Opper Tay- Un Vipper Tay- Un Set 35 3 3 3 2 2 2 13 Middle Lamphan 250 2,560 2 2 2 2 2 11 H.Laha Middle Lamphan 40 3 2 2 2 2 11 Conviry B Vicaris Kham 40 3 2 3 2 11 HLaha 40 3 2 3 2 11 Till B Vicaris Kham 40 3 2 3 2 11 11	Salavan										
H.Thon Lower Xe Set 1,800 3 2 2 3 3 13 H.Thon Gravity Upper The 660 3 2 2 2 3 3 13 Gravity Model Langhan 150 3 3 2 2 2 13 H.Laba Middle Langhan 250 2,560 3 2 2 2 2 13 H.Laba H.Laba Alicate Langhan 250 2,560 2 2 2 2 2 11 11 H.Laba Gravity B. Violage Kham 40 3 2 2 2 2 11 11 H.Laba Gravity B. Violage Kham 40 3 2 2 2 11 11 H.Laba Gravity B. Violage Kham 40 3 2 2 2 1 11 11	Xe Ser					•	2		٥	Existing Project	
H.Thon Lower Xe Set 1800 3 2 2 3 13 H.Thon Gravity Upper Thon -640 3 2 2 2 2 3 13 Gravity H.John Rian 150 3 3 2 2 13 Gravity H.Laha 150 3 3 2 2 13 H.Laha Middle Larghan 250 2,660 2 2 2 2 11 Gravity B.Violing Kham 40 3 2 2 2 2 11 Gravity B.Violing Kham 40 3 2 3 2 11 Gravity B.Violing Kham 40 3 2 3 2 11 Gravity B.Violing Kham 40 3 2 3 2 11 11 11 11 11 11	Gravity	S		7	,,	4 6			1		0
H.Thon H.Thon Gravity Upper Thon 646 3 2 2 2 3 13 Cravity Upper Thon Mew Area 2500 3 2 2 2 10 H.Tay-Un Orivity H.Nonglao 150 3 3 2 2 13 H.Taha Middle Langhan 250 2,660 2 2 2 2 11 H.Laha Gravity B.Violarg Kham 40 3 2 3 2 1 Gravity B.Violarg Kham 40 3 2 3 2 1 H.Laha Gravity B.Violarg Kham 40 3 2 3 2 1 III 111 111 111 111 111				ç,	3	,	,				
Convity Upper Thorh 640 3 2 2 3 13 Convity Upper Thorh List 3 3 2 2 2 10 H.Tay-Un Middle Langhan 150 3 3 2 2 2 11 H.Laha H.Laha H.Laha Gravity B.Violarg Kham 40 3 2 2 2 11 Gravity B.Violarg Kham 40 3 2 3 2 11 11 Gravity B.Violarg Kham 40 3 2 3 2 11 11	E										
H.Tay-Un Mew Area 2,500 3 2 2 10 H.Tay-Un 150 150 3 3 2 2 11 Convery H.Nonglao 150 3 2 2 2 11 Middle Langhan 250 2,660 2 2 2 11 H.Laha H.Laha 40 3 2 3 2 11 Genetity B.Vioang Kham 40 3 2 3 2 11 Internal 40 3 2 3 2 11	Courie	049		3	23	2	3	6.	13		٥
H.Tay-Un H.Nanglao 150 3 3 2 2 13 Gravity H.Nanglao 150 3 2 2 2 11 Opport Tay-Un 350 2,660 2 2 2 2 11 Middle Langhan 250 2,660 2 2 2 3 2 11 HLaha H.Laha 40 3 2 3 2 11 11 Genetity B.Vioang Kham 40 3 2 3 2 11 11		2,500		2	£3	2	۲3	61	01		
H.Tay-Un Gravity K.Nonglao 150 3.4.2.2.2.2.13 Convity K.Nonglao 150 2.660 2.2.2.2.2.11 Middle Langhan 250 2.660 2.2.2.2.2.11 H.Laha H.Laha Gravity B.Vioang Kham 40 3.2.2.3.3.2.11 1. 11 11											
Gravity K.Nonglao 150 3 3 2 2 11 Upper Tay - Un 350 2,660 2 2 2 11 Middle Langhan 250 2,660 2 2 2 11 H.Laha H.Laha 40 3 2 1 11 Gravity B.Viosug Kham 40 3 2 1 11	H.Tay - Un								-	Freierico Omient	
Upper Tay - Un 350 3 2 2 2 2 11 Middle Langhan 250 2,660 2 2 2 11 H.Laha Gravity B. Violang Kham 40 3 2 1 11 Gravity B. Violang Kham 40 3 2 1 11 11	Gmonto	150			.].	*	7	7	2	Existing rights	6
Middle Langhan 250 2,660 2 2 3 2 11 H.Laha Genvity B.Vioang Kham 40 3 2 1 11 11 11 11		350			2	C4	2	27	2		
H.Laha Cravity B.Vioang Kham 40 3 2 3 2 1 11		250	2,560		£3	.,	3	2	-		,
H.Laha Gravity B.Violang-Kham 40 3 2 3 2 1 1 11 11 11 11											
Gravity B Violang Kham 40							,		=	Existing Project	
	Gravity	40		8	2	F.	2		= =	Friends Prosect	
5 2000 Cna X		S		3	77	,	r1			Existing Project	

_	•	
ŕ		ı`
۹	٠,	ì
C	•	ŧ.
•	•	_
J	v	2
1	r	
	č	5
•	Ξ	4
1	C	۶,
1	L	٠
ζ	١	ď
,	Ī	The state of the s
٦	ř	
	ż	•
	2	
	t	Ė
	7	٠.
	>	ч
		4
	ā	3
	Þ	
	۵)
ŕ	ř	`
þ		•
	C	5
,	ċ	5
٠	7	í
4	Ŀ	4
1	ŗ	Ļ
	2	بد
٠.	Ĺ	2
	Ĺ	2
۰	Š	i
Ċ,	ı	ė
	Ċ	5
	7	-
1	C	
i	Č	5
4	7	
1	ŀ	
i	۲	ζ.
_	÷	í
•	đ,	,
G	ſ.	•
Ĭ		
¢	•)
,	-	Ĺ
Ċ	٠	
٢	>	
۲		e
	•	:
_	ų.	_
j	ř	ï
**	,	í
_'		•
ŧ		٠.
		٦
ŧ		•
ŧ		
ŧ		•

	D Soung	\$		m	7	3	r		-	Existing Denisors	
			<u></u>	-				1 2 1 2 2		200	
K.Namsai											
Ċ	Getwity Namsai	2,590		r	64	2	2	c	٩	Pricting Project	
	Houay Xm	280			1,	2	74		2	Freeing Project	
	Lower Namsai	1,350	5,850		7	1.4	2	2			
Total	Gravity	28.625	18,910								

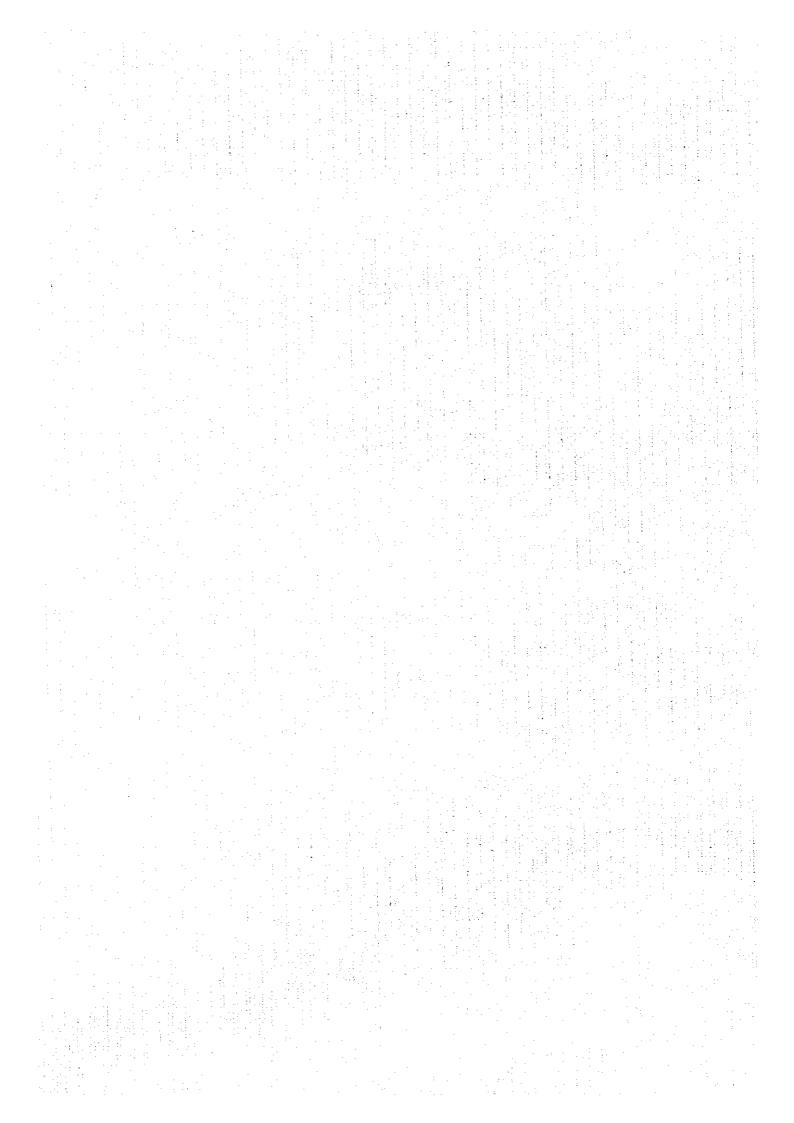
Table IV-14 Priority Irrigation Schemes in the Study Area

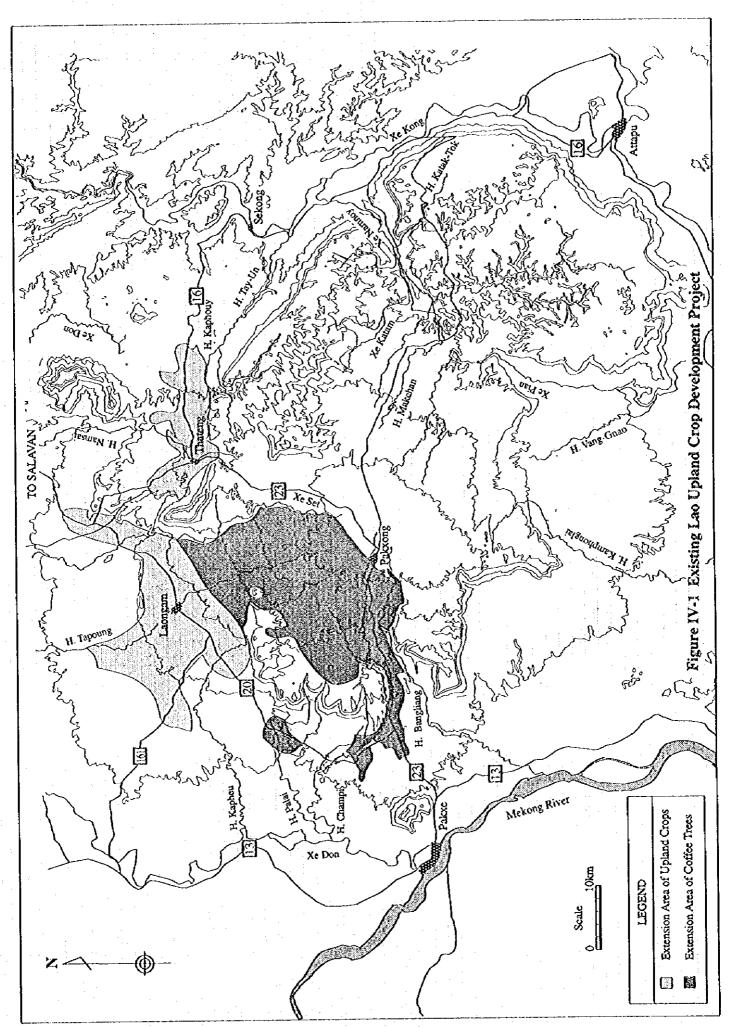
Control Control Contro		No. PROPOSED SCHEMES	WATER RESOURCES	PROPOSED CROPS / CROPPING PATTERN	TRRIGATION AREA (ha) for Master Plan	TRUGATION AREA (ha) for Femiliality Shafy	REMARKS
K.C.O.O.O.O. Table	N.T. P.				NET	JE S	
		UPPERCHAMPI	H. CHAMPI	Coffee		420	***************************************
N. P.	N. T. P. P. T. P.			Z.Marc	28	736	
N.TAMOUNG Trace 99 90 90 90 90 90 90 9	N. TANDELONG Three St. No.	***************************************		h-anderson of the last of the			, and the same of
N. Y. M.	N. MANGUAN Color 100 1	UPPER TAPOUNG	H. TAPOUNG	Type-C	96	2 2	
N. MANGOLAN Colore 100	N. T. MANGOLIAN T.						
N. NATANON There The	NAMACHAN Trace 190	LOWER XE MAN	XBMAN	Coffee	089		
N.	N. X.G.EGTAN Therefore T			7,726-0	85		
N. YELKATAN Deport 170	N. XG.KATAM				, , , , , , , , , , , , , , , , , , ,		
N. YELKATANN There 100	N. NOMENTAND There 100	UPPER WAKCHAN	H. MAKCHAN	Coffee	370		
N.	Mail			TypeC	100		
N.	N.				D.		
N.	The Property The	MIDDLE XE KATAM	XEKATAM	TypeA	340		Pull menugement in rainy season
10	10			Type-B	089		Critical season for day season paddy
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,	1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,				000		
N. CANNEGON Collect No.	NGTAM NAMEDIAL NAMEDIAL 1700-19 1700-1				# T		Marie and the second
M. MANCOLANGON Coffee	M. T.A.M.A.C.I.A.W.G.N.A. A.	MIDDLE NAMTANG	H. WARIANG	100	001		Secretary and the secretary
H. KANNICIAN-GAM, Type B 190 1	NGSNA NAMOCIAN-SNA Colfee 200			2000	3%6		
N. C.	M. CANNET The ALCOHOL The BLOCK Th				(0)		
N. CAMMEN Type-8 No	H. CAMPRIL Type-Al (Gelev-pader) 1A00	LOWER MAKCKAN-CNAL	H. MAKCHAN-GNAI	Coffee	340		Main crop is coffee
H. CERANT TreeA. (Galler-pader) 1,010 1,000	H. CHANT Treat (cliented) 1,010 1,000			Type-B	08		
K.CANME, Type-Att Getting-getter)	H. CANMER Type At Colores 1410 1400 14000				95.		
N. LAMMAN Type-10 1990	H. KANNELL Topical 1,000 1,000 1,000	LOWER CHANGI	H, CHANN	Type-A1 (follow-paddy)	1,610		Supplemental Intigation for rainy season paddy
N. LAMONNO Collect Web WO WO	N. CAPMEN, Type-AI (Allore-packs) Type-A			TypeB 2	966		
N. T. ANDOLYG Coding 1900 190	H. KALMONECT Type-61 Web				3,600		
N. T.A.M. PROVINCY Topology 1900 190	H. KAMPRET Code Type-AJ (delice-posity) HO						
Type-8 Type-8 Type-9 Type-9 Type-9	Type-3 T	UPPER KAPHEU	H.KAPHEU	Coffee	9440	900	Sumplemental Unigation for rainy season paddy
H. T.A.M.N.G.	M. T.A.POUNG 1700			TypeB1	9	100	is carecised due to the decrease of land resources.
N. TANOUNG Code 170 45	H. TANEOUNG Code Viv Story S			(Section 1) Turned (1)	1,700	1,000	
H.TAPOUNG Coffee N/0	N. T.A.POUNG				The state of the s		
N. T.ANDOUGH 1990	N.TAPOUNG DOPALLIMOTOMEND 190	MUDDLE TAPOUNC	H. TAPOUNG	Coffee	2		
Coling 190 1	N. T.A.M.B.A. 190			D-add.	Ş		
Coffee Coffee 190	Coffee Coffee 190				and the state of t		
New Year Dynamic Dyn	New York Dyne 1900 190	COWER TAPOUNG	H. TAPOUNG	Coffee	190		Supplemental Imigation for rainy season paddy
XE SET Type-A 0 200	New York			Dyn-Al (fallow-paddy)	3,890		
XE SET	XE SET Three A			Type	0		:
New YEST Type A 0 200	XE SET				4,500		
Note 1 1,240 100 1,0	Type-A T	The state of the s	110 12				
MANNOAL Tope-A	N. NAMSA Type-A 1,800	WILLIAM WELL		Tyme-B 1	1.240	908	is carried but through trans-basin plan to the
M. NAMASAL Dyne A 1,000 1,000	1,000 1,00			Type-A) ((a))ow-parity)	096	θ	Upper Thon Scheme.
N. NAMASAL Dyne-A 1,800 1,000	N. NAMENT Drope A 1,800	The state of the s			1,400	0001	
N. PANASAL Dype-A 1,000	N. NAMASAL Diggs A 1,000						
Type-A1 (fallow-paidy)	Type-A1 (fallow-paidy) 1,700	OWER NAMSAL	H. NAMSAI	1ype A	1,500		Supplemental Intigation for rainy season peoply
1,720 1,72	1,720 1,72	Control of British		Does	646		
No. Ser	X Ser			Type-A1 (fallow-paddy)	1,790		
Xe Sm	March Type A Ty	S.,	•		2,000		
Type-A1 (clion-pach)	Type A1 (Chioreguegy)	(PPER THON	Xe Sort	Type-A	0		Sumplemental Imigation for rainy assess paddy
H. LAMPHAN There Type A. 1 (Miller Type B.) 2000 H. LAMPHAN Then Type A. 1 (Miller Type B.) 2000 H. TAYLUNIN THON Type B.) 65 69 Type A. Laller Type B.) 2000 Type B.)	H. LAMPHAN Three Three 2000 H. LAMPHAN Three 2000 H. TAN-LIN's H. THON Three 3 2000 H. TAN-LIN's H. THON Three 3 80 100 Three 3 100			TypeB	246	-	
H. LAMPHAN There A. 2000 M. TAYLURUM, Then There A. 45 There A. Labler (Male) 2000 There B. 2	H. LAMITHAN The-A 2000 The-B 2000 M. TAN-SURV.H. THON The-B 1 43 70 The-AL (Millient Well) 249 190 21,259 3.140			Type-A1 (fallow-pacify)	97		
H. LAMMAN Then 2000 100	H. LAMPIAN The A 2000 The B 2000 M. TANJULIK, THON The B 60 The Discrimation 2000 The B 70 The A 100 No.						
Type-8	M. TAYLIN' I. THON Type-A	MIDDLE LAMPHAN	H, CAMPHAN	Type-A	3,000		Multi Purpose Water Resources
M.TAYLUN'M.THON Dresh 46 70 There B. 1 46 80 There B. 1 10 There M.L'Aulienswerth 20 300 AL. 21,285 3144)	AL 2012/UNIX THON There 45 70 70 70 70 70 70 70 70 70 70 70 70 70			Type-B	3000		Бечейдейни
H.TAX-UNIN.THON Type-A 49 70 Type-B 1 40 80 80 Type-AL(Aulier-packy) 240 180 Al. 21,285 3,149	M.Toy, U.W.Y. THON				A. J.		
Dpe-AL (Augressmen) 249 AL 21,285	AL. Dept. (1987) 240 Dept. (1987) 240 Dept. (1987) 240 Dept. (1987) 240	UPPER TAY-UN	H. TAY-UNI'H, THON	V-al()	45	7.0	Supplemental Impation for miny season paidly.
21,335	30	7		Type B 1	97	\$ 2	
21,3%5	21,275			Committee of the Control of the Cont	9,0	000	
		TOTAL			21,285	3,140	

Table IV-15 Selection of the Priority Development Projects

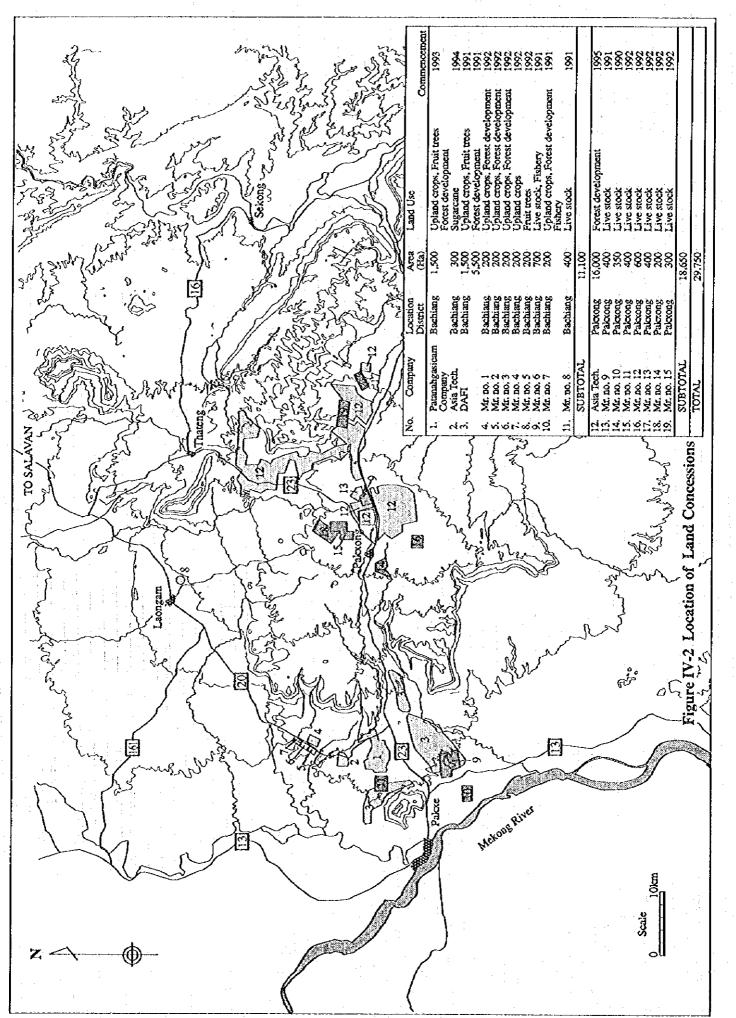
		CESCHON	POTENTIAL	200 200		7	ALUZANDO COMPA	ZDIA.				
No. PROPOSED PROJECT	PROPOSED PROJECT WATER RESOURCES	CROPS /	IRRICATION AREA	Agnevitural	Effectiveness of	Typical Agne.	Bener Capadanas	Effectiveness of Typical Agnol - Benef Coordination Easy Aggres to	Scale of	TOTAL	PVALLIATION	3767736
	Commence of the commence of th	CROPPING PATTERN	(80)	Extension	Demonstration	Suitable Onny	MICH EXISTING PRO	Suitable Crims with Existing projects, the Project areas	ă			
I UPPER CHAMPI	H. CHAMPI	COPPEE		3		-		-		Ξ.	٥	
2 UPPER TAPOUNG	H. TAPOUNG	COPPEE	s			3	1			1		
		VEGET ABLEJUM, AND CROPS / TYPE-C		**		3	7			£		
3 LOWER XE PIAN	XEMAN	COFFEE	9.2			3	6	-	7	*		
4 UPPER MAKCHAN	H. MAKCHAN	COPPLE	2,5							-		
		VECETABLE-UPLAND CROPS / TYPE-C		4 -	-	2	-		,			
5 MIDDLEXEKATAM	XEKATAM	PADDY-PADDY / TYPE-A	0.70	1	-	2	-	-	3	0	_	Surplemental Imparior
6 MIDDLE NAMTANG		UPLAND CROPS-PADDY / TYPE.B	\$40.	1		7	-	1		~	-	Supplemental Transpoor
7 LOWER MAKCHAN-GNAI	H MAKCHANGNAJ	UPLAND CROPS-PADDY / TYPE-B	OH.		1	-	-	_		•		Surplemental Impactor
8 LOWER CHAMPI	H, CHAMP	UPLAND CROPS-PADDY / TYPE-B	2,400	6	-	-				ş	-	Supplement I frame on
9 UPPER KAPHEU	H, KAPHEU	COPPLE	0)(1	3			-		2	1.1		
		UPLAND CROSS-PADDY / TYPE-B		,	,	F	r.	,	-			Supplemental Infortion
10 MIDDLE TAPOUNG	H. TAPOUNG	COFFEE	6.50	3		,	 -			2		
11 LOWER TAPOUNG	H TAPOUNG	334,00	98,	se.	-	r	1		-	25		
		CPLAND CROPS-PADDY / TYPE-B					т.	· ·				Supplemental Imparion
12 LOWER XESST	XESET	UPLAND CROPS-PADDY / TYPE-B	1,800		ſ	-			-	×	c	Sunniversal Imparim
13 LOWER NAMSA!	H. NAMSA!	UPLAND CROFS-PADDY / TYPE-8	1,200		3		_	- 5	-	2		Summent of the return
14 UPPER THON	H. THON	PADDY-PADDY / TYPE.A	0.40	1	6		_		2	2		
15 MIDDLE LAMPHAN	H. LAMPHAN	PADDY-PADDY / TYPE.A	2,900	1	3		2		'n	13		Multi Purpose Water Resources
				Company of the Compan						-	_	Development
16 UPPER TAY UN	H. TAY-UN	COPPEE	350	1				£.	2	11		
		UPLAND CROPS-PADDY / TYPE-B		1		1000			F4			Supplemental Internet
TOTAL			24,765	4.4								

Figures

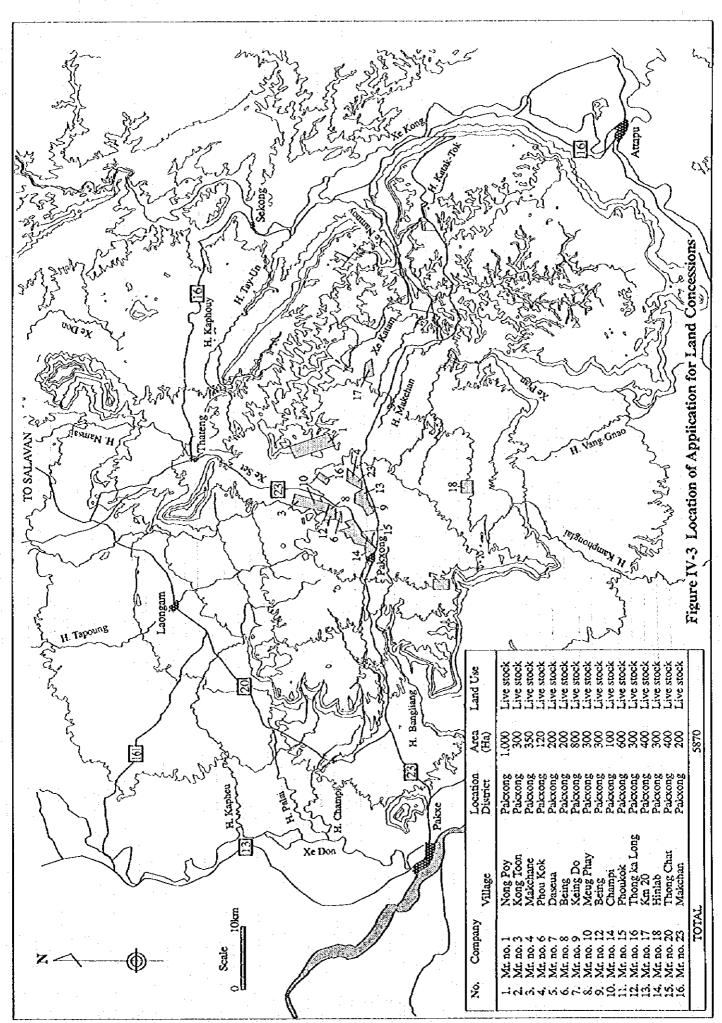




IV-F- I



IV-F- 2



IV-F-3

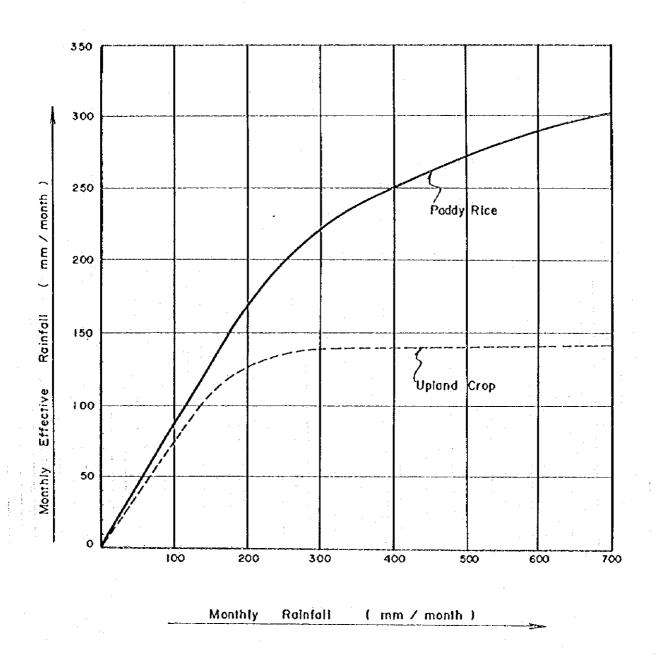
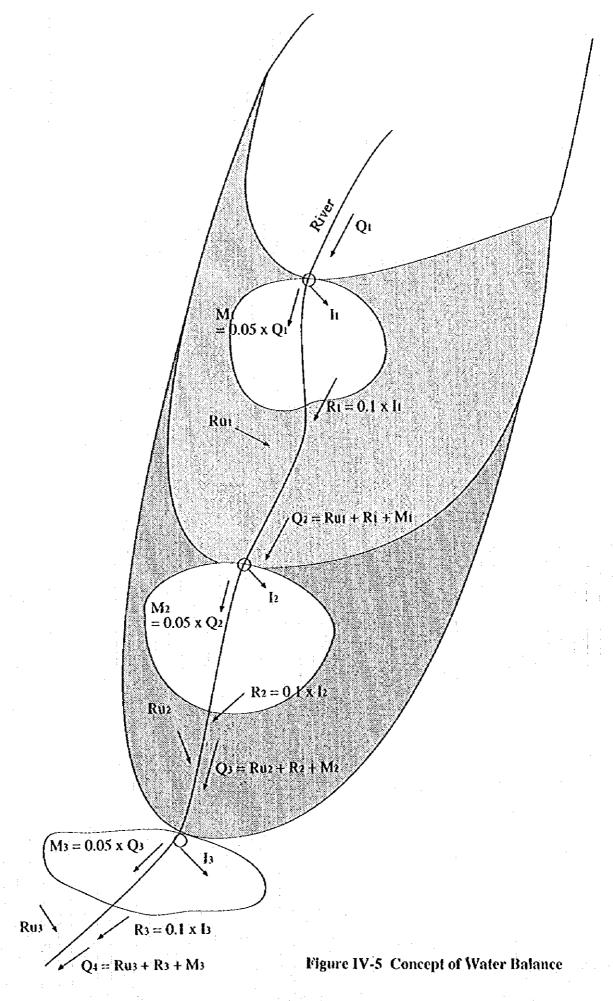
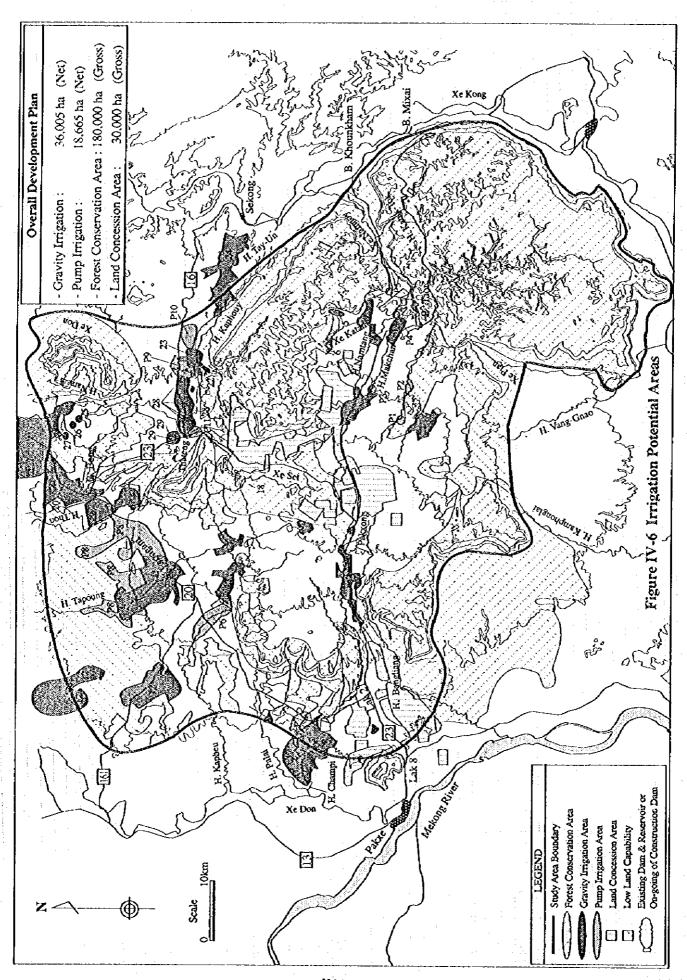


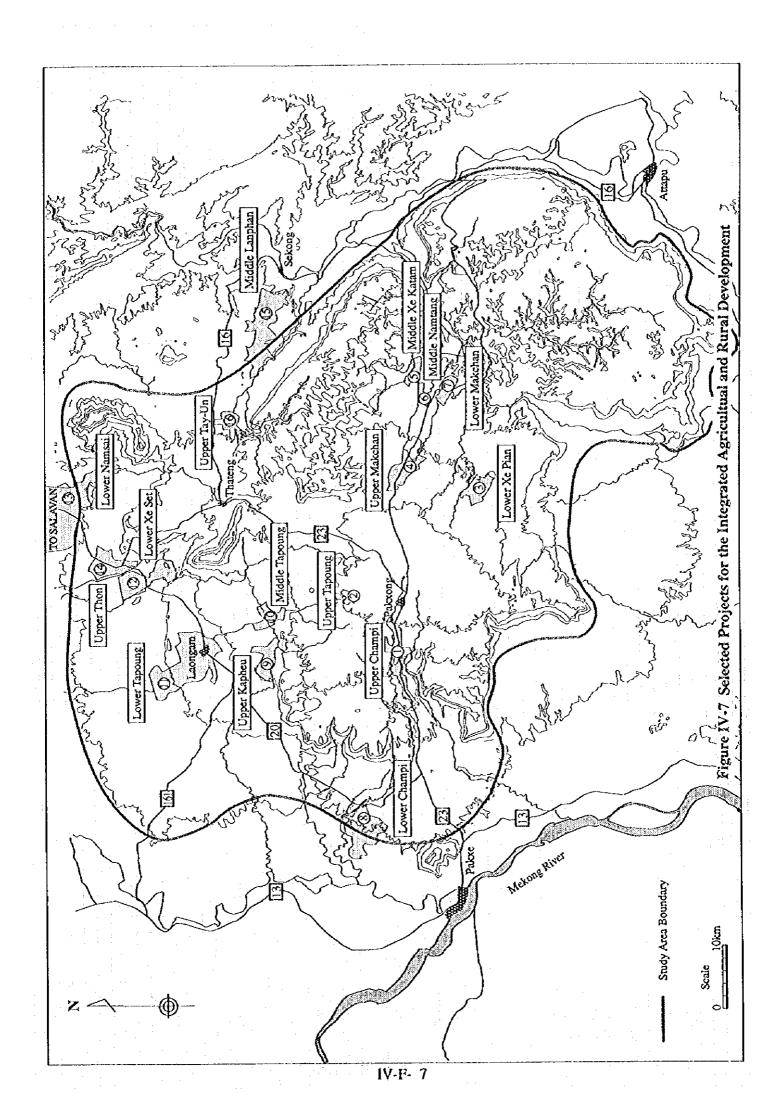
Figure IV-4 Monthly Effective Rainfall Curve

"Data Source: The Committee for Co-ordination of Investigation of the Lower Mekong Basin"





IV-F- 6



	POTENTIAL			IMPLEME	IMPLEMENTATION SCHEDULE (Year)	SCHEDU	E (Year)				
No. PROPOSED PROJECT	IRRIGATION AREA	Phase [6.	Phase II			Phase III		
	(ha)	.123 4	ن.	9		×	01 6	11	2 13	14	×
PHASEI											
UPPER CHAMPI	730	The state of the s	٠								
UPPEK TAPOUNG	05.										
TEMON X GEORY	000	The first tended to the broken by and the first of	٠								
Course No. 100				:							
LOWER XE SET	1.800	The residence of the second second second	1								
UPPER TAY-UN	330		Section 1				٠				
SUBTOTAL,	3,910										
OUA CC Y							•				
LOWER XF PIAN	750				San feet Trajerous	100 EQ 800					
-	The state of the s			i			: :	:		*	
MIDDLE TAPOUNG	450			resident segment							· · · · ·
					-					•	
LOWER TAPOUNG	4,500				N. S.	A strategy	ALL of control of the control of				
UPPER THON	640			S. C. W. Charles							
		·									
UPPER MAKCHAN	270			81	Carry of the sec						
SUBTOTAL	6,810										
			:			٠					-
PHASE III											
MIDDLE XE KATAM	620							F-100 - 5-	£		
MIDDLE NAMTANG	265							The State of the S	. Succession		
COWER MAKCHAN-GNAI	340								er zeglanaki	٠	:
LOWER CHAMPI	2.600								200		The second
LOWER NAMSAI	3,840							the taken to be a few to be taken to	a sontantante	:	
MIDDLE LAMPHAN	2,900							Company or and production	entre de la company de la comp	Section Section	
SUBTOTAL	10,565										
GRAND TOTAL	21.285]
											-

FEASIBILITY STUDY

ANNEX-IV IRRIGATION AND DRAINAGE

Table of Contents

Though the control of		Pages
PRESENT CONDITIONS 1.1 Existing Irrigation Areas in and around the Schemes		1V-1
1.2 Water Management of Existing Irrigation Areas		IV-1
2 DEVELOPMENT CONSTRAINTS		IV-1
2.1 Upper Champi Scheme		IV-1
2.2 Upper Tapoung Scheme		IV-2
2.3 Upper Kapheu Scheme		IV-2
2.4 Lower Xe Set Scheme		IV-2
2.5 Upper Tay-Un Scheme	•	IV-2
3 DEVELOPMENT CONCEPT		IV-2
3.1 Irrigation Development for Highland Vegetable Cultivation		IV-2
3.2 Supplemental Irrigation for Rainy Season Paddy		IV-3
3.3 Irrigation for Coffee		IV-3
3.4 Inland Fishery Development by Construction of Irrigation	Facilities Tacilities	IV-3
4 DEVELOPMENT PLAN		IV-4
4.1 Off-taking Method and Intake Structures	and the second second	IV-4
4.2 Irrigation Water Requirement	•	- IV-4
4.3 Irrigation Areas and Irrigation Methods		IV-5
4.4 Small Impounding Water Management		IV-5
4.5 Water Balance and Irrigation Potential		IV-6
4.6 Irrigation Canal Layout		IV-7
4.7 Canal Lining		IV-8
4.8 Operation and Maintenance Plan		IV-9
4.8.1 Construction and Provision of O&M Facilities		IV-9
4.8.2 O & M Organization	•	IV-10
4.8.3 Irrigation Operation		IV-10
4.8.4 Maintenance Schedule		IV-11
4.9 Drainage Requirement		IV-11
4.10 Soil Conservation Plan		iv-ii
4.11 Drainage Canal Layout		IV-12
4.11 Dailinge Canal Dayon 4.12 Salient Features of Irrigation and Drainage Development I	Plans	ÎV-12
4.12 I Honor Champi Scheme	Kais	IV-12
4.12.1 Upper Champi Scheme 4.12.2 Upper Tapoung Scheme		IV-I2
		ÎV-13
4.12.3 Upper Kapheu Scheme 4.12.4 Lower Xe Set Scheme		IV-13
		IV-13
4.12.5 Upper Tay-Un Scheme		
5 DESIGN		IV-14
5.1 Design Standard	the second secon	IV-14
5.2 Dacion Concent	*	IV-14

 5.3 Irrigation and Drainage Flow Chart 5.4 Design Discharge 5.5 Design of Canals, Drains and Roads 5.6 Design of Major Structures 5.7 Design of On-farm Facilities 	IV-14 IV-14 IV-16 IV-17 IV-20
List of Tables	
Table IV.1 Unit Irrigation Water Requirement (Champi) (1/3)-(3/3) Table IV.2 Unit Irrigation Water Requirement (Tapoung) (1/2),(2/2) Table IV.3 Irrigation Water Requirement (Kapheu) (1/2),(2/2) Table IV.4 Irrigation Water Requirement (Xe Set) (1/2),(2/2) Table IV.5 Irrigation Water Requirement(Tay-Un)(1/2),(2/2) Table IV.6 Water Balance Calculation(Upper Champi Scheme) Table IV.7 Water Balance Calculation (Upper Tapoung Scheme) Table IV.8 Water Balance Calculation(Upper Kapheu Scheme) Table IV.9 Water Balance Calculation (Lower Xe Set Scheme) Table IV.10 Water Balance Calculation (Lower Upper Tay-Un) Table IV.11 Salient Features of Upper Champi,	IV-T-1 IV-T-4 IV-T-6 IV-T-8 IV-T-10 IV-T-12 IV-T-16 IV-T-19 IV-T-22 IV-T-25
List of Figures	
Figure IV.1 Figure IV.2 Figure IV.3 Figure IV.4 Figure IV.5 Figure IV.5 Figure IV.5 Figure IV.6 Figure IV.7 Figure IV.7 Figure IV.7 Figure IV.8 Figure IV.9 Figure IV.9 Figure IV.9 Figure IV.9 Figure IV.10 Figure IV.10 Figure IV.10 Figure IV.11 Figure IV.11 Figure IV.12 Figure IV.12 Figure IV.13 Figure IV.14 Figure IV.15 Figure IV.15 Figure IV.16 Figure IV.17 Figure IV.18 Figure IV.19 Figure IV.19 Figure IV.10 Figure IV.10 Figure IV.10 Figure IV.11 Figure IV.12 Figure IV.13 Figure IV.14 Figure IV.15 Figure IV.15 Figure IV.16 Figure IV.17 Figure IV.17 Figure IV.18 Figure IV.19 Figure IV.19 Figure IV.19 Figure IV.10 Figure IV.10 Figure IV.11 Figure IV.11 Figure IV.12 Figure IV.13 Figure IV.14 Figure IV.15 Figure IV.16 Figure IV.17 Figure IV.19 Figure IV.19 Figure IV.19 Figure IV.20 Figure IV.20 Figure IV.21 Figure IV.21 Figure IV.22 Figure IV.23 Figure IV.24 Figure IV.25 Figure IV.25 Figure IV.26 Figure IV.27 Figure IV.27 Figure IV.27 Figure IV.28 Figure IV.29 Figure IV.29 Figure IV.29 Figure IV.29 Figure IV.20 Figure IV.21 Figure IV.21 Figure IV.22 Figure IV.23 Figure IV.24 Figure IV.25 Figure IV.26 Figure IV.27 Figure IV.27 Figure IV.28 Figure IV.28 Figure IV.29 Figure IV.20 Figure IV.20 Figure IV.21 Figure IV.21 Figure IV.22 Figure IV.23 Figure IV.24 Figure IV.25 Figure IV.26 Figure IV.27 Figure IV.27 Figure IV.28 Figure IV.29 Figure I	IV-F-1 IV-F-1 IV-F-1 IV-F-1 IV-F-1 IV-F-2 IV-F-2 IV-F-5 IV-F-6 IV-F-8 IV-F-9 IV-F-10 IV-F-11 IV-F-12 IV-F-13 IV-F-14 IV-F-15 IV-F-16 IV-F-17 IV-F-18 IV-F-19 IV-F-20 IV-F-21 IV-F-21 IV-F-23 IV-F-24 IV-F-25 IV-F-26 IV-F-27

. . . .

Figure IV.29 Figure IV.30	Unit Irrigation Network for Upland Crops No.2 Irrigation Canal Profile in Upper Champi Scheme (1/3)-(3/3)	IV-F-2 IV-F-2
Figure IV.31	Irrigation Canal Profile in Upper Tapoung Scheme	IV-F-3:

FEASIBILITY STUDY

ANNEX IV (IRRIGATION AND DRAINAGE)

1 PRESENT CONDITIONS

1.1 Existing Irrigation Areas in and around the Schemes

Small irrigation systems constructed and managed by farmers themselves were found out at 5 sites in and around the 3 Scheme areas, namely Upper Kapheu, Lower Xe Set and Upper Tay-Un. Water off-take systems for the irrigation areas are mainly small brush weirs which are made with stone, wood and bamboo. Irrigation water is conveyed through small earth canals by gravity method. Related structures are not constructed and diversion of water supply is carried out by timber stop logs. Irrigation water supply is carried out for rainy season paddy cultivation only. Drainage canal systems are not found out. The followings are the features of the existing irrigation systems:

No.	Location	Village	Water Source	Weir Type	Area (ha)	No. of Farmers
1.	Upper Kapheu	B.Sixiangmai	Kapheu River	Brush weir	4	6
2.	Löwer Xe Set	B.Nateu	Thon River	Brush weir	7	5
3.	46	B.Natou	Xe Set River	Brush weir	7	13
4.	"	-	Spring	-	10	19
5.	Upper Tay-Un	B.Chakamrit	Thon River	Brush weir	13	6

1.2 Water Management of Existing Irrigation Areas

Operation and maintenance works of all existing irrigation systems are conducted by some farmer themselves as follows, but irrigation water user group are not established. Operation of irrigation water supply is carried out only in the rainy season and no irrigation practices is done in the dry season in all existing systems. Operation and maintenance works of canals are executed by farmers themselves.

2 DEVELOPMENT CONSTRAINTS

Development constraints in the 5 Scheme areas are generally pointed out (1) accessibility to intake sites due to deep valley of the rivers, (2) high dam-up of intake, (3) limitation of water resources in dry season due to small watershed management area, (4) soil erosion in the opened forest, bush and grassland which are left after slash and burn cultivation. Constraints to the each Scheme Development are summarized as follows;

2.1 Upper Champi Scheme

The H. Champi which is water resources of the Scheme has formulated a deep valley from up stream to down stream of the Scheme area, and both the banks of the river has a steep cliff. These deep valley gives severe conditions to make plans on intake structure and canal layout of head race section. As for the result that the intake structure is selected to provide in upstream in order to avoid higher dam-up at intake structure, water resources of irrigation in the dry season is limited due to the decrease of watershed management area. Soil erosion problems are generally found out in the entire Scheme area, and specially in the opened land such as tea and coffee plantation areas and grassland.

2.2 Upper Tapoing Scheme

Land capability of left bank of the H. Tapoung is evaluated to severe conditions for upland farm development, but the left bank has suitable conditions for development. Soil erosion problems are found out in the entire Scheme area, specially, in grassland and watershed management area of the proposed reservoir.

2.3 Upper Kaphen Scheme

The H. Kapheu flows in deep valley, and steep and long cliff is formulated. The accessibility to the proposed intake structure is much severe. Layout of headrace of irrigation canals has also severe conditions. Water resource for irrigation in the Scheme area is limited in the dry season due to small watershed management. Soil erosion problems are specially found out in the opened forest land.

2.4 Lower Xe Set Scheme

Water resources of irrigation is the Xe Set river, and the river water at intake structure is the water released from the hydropower station. The design flood discharge is estimated at about 1,000 m3/sec. at intake structure site, taking into account the design discharge of spillway of the Xe Set dam. The discharge of river water is not stable at intake structure in the dry season due to the peak operation system of hydropower station. Therefore, complicated water management will need for off-taking irrigation water in the dry season. Lower irrigation areas of the Scheme has severe conditions for paddy and upland field development due to low land capability evaluated from view points of the rockiness and gravel of the soils. Soil erosion problems are generally found out in the entire Scheme area, specially in bush area, grassland and the opened forest areas.

2.5 Upper Tay-Un Scheme

Water resources of irrigation are the H. Tay-Un river and the H. Thon river. Water resource of the H. Tay-Un is limited in the dry season due to absorption of irrigation water in upper stream areas. Soil erosion problems are specially found out in the bush and grassland.

3 DEVELOPMENT CONCEPT

3.1 Irrigation Development for High Land Vegetable Cultivation

High land vegetable cultivation is proposed in terrace with the altitude of more than 1,200 m instead of coffee plantation because of cool climate condition. In the Feasibility Study, vegetable cultivation is also proposed in the 2 scheme areas, namely Upper Champi and Upper Tapoung Schemes. Small and primitive vegetable practices are conducted in back yard of village areas and remote hill slopes currently, but the yield and production are unstable and low due to insufficient farm input, extension technology, climate condition, insect and decease, transportation and marketing, etc. One of the most significant reasons on the unstable and low production is water shortage and water management.

To sustain stable and high yield and production of vegetable cultivation, simple and economic irrigation facilities are provided in vegetable cultivation areas. The simple and economic irrigation facilities are proposed as earth canal system, farm pond, small related structures and drainage canal system only in order to conduct irrigation at vegetable farms by furrow irrigation method. Modernized irrigation facilities such as sprinkler and pipe line system, drip irrigation system are not proposed because expensive initial investment, expensive maintenance and complicated management will not be expected in this development stage.

However, farm roads which have another functions such as inspection road for tertiary canal and drain, farm bund for soil conservation are also provided as well as irrigation and drainage development facilities.

In agricultural extension development program, the high land vegetable demonstration and trial station is proposed to construction the Upper Champi Scheme area. As the station has demonstration vegetable farms of more than 30 ha, irrigation and drainage canals and related facilities are provided as one irrigation block of the Upper Champi irrigation scheme.

3.2 Supplemental Irrigation for Rainy Season Paddy

Supplementary irrigation in rainy season aims to sustain the stable growth of rainy season paddy, if existing paddy field and / or potentials of paddy field development are confirmed in and around the Scheme area. In the Feasibility Study, this concept can be adopted in the two (2) Schemes, namely Lower Xe Set and Upper Tay-Un Schemes.

Surplus water discharge of the Xe Set river in rainy season which is deducted the maintenance flow to down stream areas and irrigation water for the Xe Set Scheme from river discharge at just before intake structure can be conveyed to paddy fields of the neighboring scheme as irrigation water of paddy field. Because irrigation potentials in the Xe Set Scheme can not expanded, since the Scheme area is scheduled to develop fully based on land suitability. In this case, the supplemental irrigation can be carried out, using the water resource of the Scheme, but the beneficial paddy fields are in the other Scheme area. In the Upper Tay-Un Scheme, surplus discharge of both water resources, namely the H. Tay-Un and the H. Thon can be used as irrigation water for rainy season paddy cultivation in the Scheme area.

3.3 Irrigation for Coffee

Irrigation method and / or system for coffee plantation have not been established in the Boloven Plateau area as well the Laos country area. In an implementation program of the Boloven coffee project which is technical assistance project undertaken by French Government, research works of irrigation practices is scheduled in future stage because of lack of water resources development facilities. A present, agronomic research and extension works are implemented.

Current coffee plantation has met water shortage problem during flowering to fruiting stages of coffee in the dry season, specially, in the lower altitude areas of less than 700 m above mean sea level. Due to this water shortage problem, production of coffee is always unstable and furthermore, is affected by the starting of rainy season.

On the other hand, labors for unloading and drying works of coffee fruits are family labors and seasonal labors. Seasonal labors are currently procured from low land area after harvesting rainy season paddy in the area. In the full development stage of coffee plantation through the implementation of the Scheme and the Boloven coffee project, severe problems of labor procurement will be focused.

Taking into consideration these subjects, irrigation for coffee aims to control flowering to fruiting stage of coffee trees for 3 months and to sustain stable coffee production. Controlling the flowering stage can indirectly effect to control peak labor requirement during harvest season and to give more reasonable business opportunity to coffee grower.

3.4 Inland Fishery Development by Construction of Irrigation Facilities

Daily markets are not located in a walking distance in the each the Scheme, and village peoples' protein consumption is generally low because of physical problems of marketing system and transportation and market prices. Their main protein resources are chicken, fishes

and wild animals.

On the other hand, in irrigation development plan, the impounding pond facilities such as reservoir and regulation / farm ponds are planed to construct in the each scheme area. Therefore, development component on simple inland fishery is involved to improve the village peoples' food conditions.

PLAN DEVELOPMENT

Off-taking Method and Intake Structures 4.1

Intake sites of the Upper Champi and Lower Xe Set Schemes are generally formulated by deep valley and steep cliff, and rather high dam-up of intake structure need to take off irrigation water and domestic supply water. But, gravity off-taking method is adopted, because application of pump up method is questionable for future water management and maintenance works, taking into consideration current farmers' farming practice and agricultural supporting services, etc. as description of off-taking method in the Part I, Master plan. Type of intake structure at both the Schemes is a concrete weir with a intake gate.

The off-taking method at the other 3 Schemes is also gravity method. structure is a concrete weir for the Upper Kapheu and Upper Tapoung Schemes and an homogeneous earthfill dam and a concrete weir for Upper Tay-Un Scheme.

4.2 Irrigation Water Requirement

Based on rainfall date for 10 years from 1986 to 1995 and the proposed cropping patterns, inigation water requirement is estimated by using the following formula.

IWR = (ETc + Pr + Pd + Nr - ER) / Ei

gross irrigation water requirement where: IWR

> net water requirement WR overall irrigation efficiency Li ETc crop consumptive use of water

percolation for paddy

puddling requirement for paddy Pd

nursery requirement for paddy Nr

effective rainfall

Basic data for this calculation such as potential evapo-transpiration (ETo), crop coefficient (Kc), effective rainfall (ER), percolation (Pr), puddling requirement (Pd), nursery requirement (Nr) and overall irrigation efficiency (Ei) are used the same figures presented in the Part I, the Master Plan Study. Detailed estimation on irrigation requirement of the each Scheme are shown in Tables IV.1 to IV.5. Seasonal irrigation requirement of the each cropping pattern is estimated as shown below, adopting rainfall data for there 10 years.

Scheme	Prposed Cropping	Seasonal Irrigation
	Pattern	Requirement (mm)
Upper Champi		
	Type-C (VegUpland Crop)	305 - 729
į	Coffee	79 - 160
Upper Tapoung		
	Type-C (Veg Upland Crop)	305 - 729
Upper kapheu		
	Type-B 1 (Upland Crop-Paddy)	911 - 1,360
	Coffee	123 - 205
Lower Xe Set		T
	Type-A (Paddy-Paddy)	1,627 - 2,299
	Type-B 2 (Upland Crop-Paddy)	1,170 - 1,649
Upper Tay-Un		
	Type-A (Paddy-Paddy)	1,222 - 2,291
	Type-B 2 (Upland Crop - Paddy)	778 - 1,707

4.3 Irrigation Areas and Irrigation Methods

In accordance with test result on field intake rate, the basic intake rate in the 5 Scheme areas is estimated about 25 mm / hr. at the maximum level. In evaluation of land capability, the maximum topographical slopes in suitable to moderately suitable land for development is adopted about 4%, and the majority of irrigation areas of the all Schemes has been screened as the land with slopes of less than 4%. Therefore, any irrigation method for upland crops can be adopted in all the Schemes from view points of the soils and topography.

The following three (3) methods are adopted for irrigation of each crop.

- (i) Furrow irrigation method for upland crops including vegetables,
- (ii) Border irrigation method for coffee and (iii) Surface irrigation method for paddy.

4.4 Small Impounding Water Management

To aim the optimized use of water resources in the rainy season and to expand irrigation areas as much as possible based on the land suitability in the each Scheme area, small impounding ponds are provided, taking into consideration topographical conditions and location of irrigation areas.

Except for the Lower Xe Set Scheme, eight (8) small impounding ponds are provided to construct small scale earthfill dams with dam height ranging from 8 m to 20 m in the four (4) Scheme areas such as one (1) site in the Upper Champi Scheme, one (1) site in the Upper Tapoung Scheme, four (4) sites in the Upper Kapheu Scheme and two (2) sites in the Upper Tay-Un Scheme.

Water management of all impounding ponds are to operate through all the seasons, and to storage river water in the rainy season as much as possible for irrigation use in the dry season. Reservoir storage curve of the each scheme is shown in Figures IV.1 to IV.4.

Storage capacity of reservoirs is determined to supply water in all irrigation areas during a drought year of 80 % chance base on water balance calculation, and the following storage capacities of respective reservoirs are provided.

Scheme	Dam & Reservoir	Active Capacity (1,000 m3)
1 Upper Champi	Champi Dam	105
2 Upper Tapoung	Tapoung Reservoir	240
3 Upper Kaphue	Dam No.1	140
4	Dam No.2	57
15	Dam No.3	58
6	Dam No.4	140
	Subtotal	395
7 Upper Tay-Un	Dam No.2	135
8	Regulation Pond	65
	Subtotal	200

4.5 Water Balance and Irrigation Potential

Water resources for the development are estimated based on monthly water balance calculation between river runoff at the proposed dam site, water demand consisting of irrigation water, domestic water supply, water loss in the reservoir and maintenance river flow for ten (10) years, from 1986 to 1995.

Concept of water balance is presented in the following formula.

$$(R - (L1 + L2 + M + D)) = C + SP$$

Where,

R: Seasonal runoff
L1: Evaporation loss
L2: Seepage loss
M: Maintenance flow
SP: Spill out discharge
C: Reservoir capacity

D: Irrigation demand and domestic water supply

Evaporation and seepage losses from reservoir are assumed at 7 mm/day. The maintenance flow released from a dam are estimated as 5 % of the total flow, taking into consideration the current social condition and water use in the down stream areas. As for the Lower Xe Set Scheme area, water balance at intake site is included the current irrigation demand of the two (2) existing irrigation projects, namely, Nong Deng and Soutava Di projects, located downstream of the Lower Xe Set Scheme area.

Water resources for irrigation in the each the Scheme is estimated to sustain full water supply during drought year of 80 % chance, based on the proposed cropping patterns, and, irrigation areas of all the schemes are determined taking into consideration the land suitability and results of water balance in the each scheme as shown below. The detailed is shown in Tables IV.6 to IV.10.

	ng, apala Malai Branca, Landon, arang arang mengangan bahan		PROPOSED CROPS /	IRRIGATION AREA (ha
No.	PROPOSED SCHEME	WATER RESOURCES	CROPPING PATTERN	for Feasibility Study
			(Master Plan)	NET
1	UPPER CHAMPI	H. CHAMPI	Coffee	620
			Type-C	110
•••••	SUBTOTAL			730
2	UPPER TAPOUNG	H. TAPOUNG	Туре-С	80
	+ 1			80
3	UPPER KAPHEU	H. KAPHEU	Coffee	900
			Type-B 1	100
	SUBTOTAL	***************************************		1,000
4	LOWER XE SET	XESET	Type-A	200
		·	Type-B I	800
•••••	SUBTOTAL	:		1,000
5	UPPER TAY-UN	H. TAY-UN/H. THON	Туре-А	70
			Type-B 1	80
			Type-A1 (fallow-paddy)	180
	SUBTOTAL			330
	TOTAL			3,140

4.6 Irrigation Canal Layout

Irrigation canal networks generally consists of head race, main canal, secondary canal and tertiary canal. Concrete block lining is provide from head race to secondary canals. Head race and main canal are basically laid out vertical direction against to contour lines. Secondary canals are laid out to branch off from main canal with a interval of about 500 m, and to follow the contour lines. Tertiary irrigation block is roughly demarcated about 30 ha.

Basic concept of canal layout on the each scheme is considered as follows;

(1) Upper Champi Scheme

Irrigation area is expanded from km 47 to km 35 of the national road No. 23, and the irrigation blocks of about 610 ha and 120 ha are respectively located in the northern area and southern area from the road. Irrigation water is conveyed to settling basin, and distributed through 2 main canal systems.

A main canal system is laid out to supply water in the upper irrigation area of the northern irrigation block including the high land vegetable demonstration and trial station. The other main canal system is expanded in the both irrigation blocks, coinciding a small scale impounding pond which are located in just down stream from vegetable farm blocks. A secondary canal, namely SI-2 is branched off near km 43 to supply water in the southern irrigation block, going across the national road No.23, and the other secondary canal, namely SI-3 extends to km 35 of the national road No.23. General canal layout is shown in Figure IV.5.

(2) Upper Tapoung Scheme

Main canal is laid out on the left bank of the H. Tapoung river along the river course. Main canal goes across a provincial road about 300 m far from the intake structure site. A level crossing structure is provided at crossing point with a small tributary of the river. General canal layout is shown in Figure IV.6.

(3) Upper Kapheu Scheme

Irrigation area is broadly divided into 2 irrigation blocks by a provincial road, and expands along the road from Sixiagmai village area to On-gnai village area. Main canals of 2 systems are laid out in the irrigation area. A main canal system is branched off near Sixiagmai village area and goes across the provincial road to supply water in the southern area from the road. This main canal system has four (4) small scale impounding ponds to optimize irrigation water use, and conveys irrigation water to down stream area and is laid out to supply irrigation water in the down stream area of both the blocks, going across the provincial road near On-noi village again. The other main canal system extends substantially to supply water in the northern irrigation block nearby On-gnai village. General canal layout is shown in Figure IV. 7.

(4) Lower Xe Set Scheme

Main canals of four (4) systems are laid out to cover the eastern and northern areas of the Scheme. A main canal system extends nearby Natteu village of the eastern area from just the down stream of a regulation pond, and the other main canals of 3 systems extend to go across a national road No. 20 to supply irrigation water in the northern area to supply irrigation water nearby Sengvang-noi village at the eastern boundary of the Scheme and Natou village at the western boundary of the Scheme. General canal layout is shown in Figure IV.8.

(5) Upper Tay-Un Scheme

Main canals are broadly divided into 3 system due to the 2 water resources of the Scheme, namely, the H. Tay-Un and the H. Thong. A main canal system which the water resources is the H. Tay-Un supplies irrigation water in the upper irrigation area of the Scheme and conveys water to a regulation pond. The second main canal system which the water resources is the H. Thong convey water to irrigate in the upper irrigation area expanding nearby the conjunction of the both the main systems. The third main canal system is laid out to carry out irrigation in the lower irrigation area from the conjunction of both the first and second main canal systems. General canal layout is shown in Figure IV.9.

4.7 Canal Lining

According to results of soil investigation, soils in the majority areas of all schemes are dystric nitosols soils group which origin of soil is basaltic rock. It' characteristics is so pouras and erosive against to rainfall. Therefore, in the design on canal system, thin concrete block lining which the material will be consisting of basaltic gravel, sand and cement is adopted to save seepage loss of irrigation water, to increase the irrigation efficiency and to make easy maintenance works by farmers, themselves. The canal lining is adopted to provide in main and secondary canals.

Type of concrete block is pre-cast concrete blocks which is made near the construction sites, and thickness of concrete blocks is 7 cm. Total length of concrete lining is about 75 km including tertiary canal lining of about 20 km, and concrete canal lining is planed in the each Scheme as shown below.

No.	Scheme	canal Length (km)
i	UPPER CHAMPI	
	Main Canal	4.7
	Secondary canal	13.0
	SUBTOTAL	17.7
2	UPPER TAPOUNG	
	Main Canal	1.6
	Secondary canal	0.8
	SUBTOTAL	2.4
3	UPPER KAPHEU	
	Main Canal	2.2
	Secondary canal	11.8
	SUBTOTAL	14.0
4	LOWER XE SET	
	Main Canal	3.6
	Secondary canal	11.0
	SUBTOTAL	14.6
5	UPPER TAY-UN	
	Main Canal	2.5
	Secondary canal	2.3
	SUBTOTAL	4.8
	TOTAL	53.5

4.8 Operation and Maintenance Plan

Operation and maintenance plan of irrigation facilities are considered at following 4 points;

- (i) Construction and provision of O & M facilities
- (ii) Establishment of O & M organization
- (iii) Irrigation operation
- (iv) Maintenance schedule

4.8.1 Construction and Provision of O & M Facilities

(1) Provision of discharge measurement structures for water operation

Discharge measurement of irrigation water need to carry out sufficient and successful water operation in the entire irrigation areas. Since irrigation water is taken off at intake structure and distributed to lower grade canals such as secondary and tertiary canals by turn out and / or division box, the measuring structures are provided at downstream from the each intake gates, turn out and division box. The measurement also need at just down stream from farm pond which is constructed at head section of secondary canal in order to carry out timely and sufficient irrigation in upland crop fields. Type of measuring structure is designed as a broad crested weir for main canal system and to provide a gauging staff for tertiary canal system.

(2) O & M facilities

For irrigation operation and maintenance works of irrigation facilities, the following facilities shall be provided.

- (i) Radio system for irrigation operation
- (ii) Vehicle and motor cycle for transportation, operation, monitoring and maintenance works
- (iii) Maintenance equipment of irrigation facilities which will be sustained by the

Government agencies

(iv) O & M work office and gate keeper houses

4.8.2 O & M Organization

Establishment of water users' association and village water users' group needs to carry out successful O & M works. The water users' association and village water users' group shall be collaborated with village agriculture association and supported by other government agencies such as district agriculture services, provincial agriculture authority and Ministry of Agriculture and Forestry, and conduct the following 4 main activities and functions as much as possible.

(i) Maintenance works

(ii) Establishment of irrigation schedule

(iii) Monitoring work

(iv) Collection of water charge

(1) Maintenance works

Maintenance works of the facilities is broadly divided into 2 groups depending to a scale of budget and engineering / technical aspects. The responsibility of maintenance works are undertaken that maintenance on main canal system which covers from a diversion structure at water resources to secondary canal is carried out by the government agencies such as provincial agriculture authority and Ministry of Agriculture and Forestry, and that those of tertiary canal system is carried out by the water users' association and village water users' group.

Maintenance works are scheduled to carry out as periodical and emergency maintenance works because all the scheme have diversion weirs, small scale impounding ponds and farm ponds.

(2) Establishment of irrigation schedule

Based on agricultural extension program on cropping patterns, the water users' association and village water users' group confirm their own operation of irrigation water supply and establish the irrigation schedule in the entire irrigation area.

(3) Monitoring works

Monitoring system and schedule are established in periodical and emergency cases under smooth cooperation with the government agencies such as provincial agriculture authority and Ministry of Agriculture and Forestry. The filing system on monitored data and information are planed to use for the preparation of maintenance schedule.

(4) Collection of water charge

The optimized water charge are planed to collect from all beneficiaries by the water users' association to provide the budget for maintenance works.

4.8.3 Irrigation Operation

Irrigation operation is generally effected by the proposed cops such as coffee, upland crops including vegetables and paddy. Irrigation hours is scheduled to conduct 24 hours for paddy, 12 hours for upland crops and coffee. The irrigation hours of upland crops and coffee is estimated at the peak irrigation requirement period. A farm pond is provided at head section of secondary canal in order to control water supply in the command area. Therefore, gate operation of farm pond shall be periodically reviewed during cultivation period.

Furthermore, irrigation of coffee aims to control the flowering to fruiting stage of coffee and indirectly to control labor requirement in the harvest period. To reach these goals, rotation of irrigation is scheduled for about 3 months from the end of December to the beginning of January. Therefore, gate operation of turn out of main canals is also specially reviewed during these 3 months to fit rotation schedule.

4.8.4 Maintenance Schedule

Maintenance works. Both the maintenance works are considered in the plan. Main maintenance works are repairing works of gates at diversion weir, disposal of sediment in settling basin, cleaning works of earthfill dam and impounding pond, cleaning works of farm pond and cleaning of lining canal section. Maintenance method and schedule shall be timely established in the future stage, based on the collected information and data through monitoring works in collaboration with the government agencies.

4.9 Drainage Requirement

Drainage requirement for the priority development schemes are estimated by using rainfall data for ten (10) years from 1986 to 1995. Estimation methodology of the drainage water requirement for the selected priority area is divided into two, paddy and upland fields. For the paddy field, such requirement is estimated to evacuate the surplus rain water with the drainage period of 3 days by using the probable daily rainfall which has a probability of once in a 5-years. Besides, rational formula is applied for the upland field to estimate the drainage water requirement with a probability of once in a 5-years. The runoff coefficient is assumed at 0.5, taking into consideration the proposed crops, crop farming system and soil conservation plan at on-farm. Drainage period of four (4) hours for vegetables and one (1) day for other upland crops are considered. Estimated results are as follows;

Priority Project	Probable Daily	Paddy Field	Upland Field		
Area	Rainfall (mm/day)	q (lit /sec/ha)	r, (mm/hr)	q (lit./sec/ha)	
Upper Champi	272.1	10.5	27.8	38.6	
Upper Tapoung	272.1	10.5	27.8	38.6	
Upper Kapheu	186.0	7.2	7.8	10.8	
Lower Xe Set	186.0	7.2	7.8	10.8	
Upper Tay-Un	86.0	3.3	3.6	5.0	

4.10 Soil Conservation Plan

Soil conservation plan is proposed from view points of farming technology and civil engineering. In this canal layout, since surface drainage on farm level is designed to sustain the farm ditch in horizontal direction, soil conservation method such as mulch-cultivation, shade tree, etc. will be planed. As for soil conservation method from view point of civil engineering aspect, 2 method such as (i) farm bund and (ii) boulder drop structure are planed.

Farm bund is designed to lay out with horizontal direction to topographic contour line to make a natural gentle terrace for a long term. Farm bund is planed as an alley cultivation and is earth embankment with a gravel filter section at crossing point with a tertiary drain. A width of farm bund is 2 m. The other dimension are as follows;

RANGE OF	INTERVAL OF	HEIGHT OF
GROUND SLOPE	FARM BUND	FARM BUND
(%)	(m)	(nı)
Less than 5 %	100	ì
5% 8%	- 50	i

Furthermore, other small farm bund, namely, on-farm bund is also provided as temporary farm bund from view point of farming technology.

Boulder drop structure is planed to provide in main drains which have a vertical direction against topographic contour lines to sustain the allowable maximum velocity of drainage canal. Material of the structure is mainly boulders which can be collected near the sites.

4.11 Drainage Canal Layout

Drainage canal system is consisting of main, secondary and tertiary drains. Main drains are laid out in river courses and / or existing drains as much as possible. If drainage length is laid out so rather long, main drain is connected with rivers and / or other drainage system in order to distribute big drainage discharge and to protect soil erosion along the drain. A tertiary drain is provided in the each tertiary irrigation block. Tertiary drain is basically laid out to follow topographical contour line. Total length of secondary drains to be constructed is about 12 km, and the detailed of the each scheme is as shown below. General layout of main drains in the each scheme are shown in Figures IV.5 to IV.9.

No.	PROPOSED SCHEME	LENGTH (m)
ī	UPPER CHAMPI	
	Secondary drain	3.0
2	UPPER TAPOUNG	
	Secondary drain	0.2
3	UPPER KAPHEU	
	Secondary drain	1.1
4	LOWER XESET	
	Secondary drain	7.6
5	UPPER TAY-UN	
	Secondary drain	0.1
	TOTAL	12.0

4.12 Salient Features of Irrigation and Drainage Development Plans

The salient features of the each scheme are shown in Tables IV.11 to IV.12. The basic features of the schemes are presented below.

4.12.1 Upper Champi Scheme

Irrigation water is off-taken by concrete diversion weir proposed at upper stream of the Champi river which is adjacent to the post km 47 along the national road No.20 from Pakxe to Pakxong and supplied to the left bank area of the Champi. Diversion weir has a height of 9.5 m and a width of 43 m. The irrigation area is 730 ha, and the crops to be irrigated are vegetables, upland crops and coffee.

Irrigation canal networks consist of 2 main canals of about 5 km, 3 secondary canals of approximately 13 km, tertiary canals, an impounding pond with an active storage capacity of about 105,000 m³, farm ponds and related structures. Canal lining of about 23 km is planed in main irrigation canals networks to increase the irrigation efficiency. Drain networks consisting of 8 secondary drains of about 3 km and related structures, and inspection and farm roads networks of about 22 km paved with gravel are planed. General layout is shown in

Figure IV.5.

In line with agriculture extension development program, highland vegetable trial and demonstration station is planed to be constructed in the area. The station area is about 50 ha including office buildings, accommodation, trial and demonstration farms, etc..

4.12.2 Upper Tapoung Scheme

Irrigation water is off-taken at the outlet of existing pond of the Tapoung river located near B. Xetapung village by concrete diversion weir with a height of 7.5 m and a width of 38 m. Irrigation area is upland field of 80 ha which is expanded at left bank of the river. Main crops are vegetables and upland crops. Storage capacity of existing pond is increased by about 240,000 m⁻³. New inland fish cultivation is planed in the newly developed reservoir. In canal and drain networks, one (1) main and one (1) secondary irrigation canal are planed to layout about 2.5 km in total length, and one (1) secondary drain is laid out with a total length of approximately 200 m. Canal lining is also planed to provide about 3 km in main to tertiary canals. Inspection and farm roads are planed about 5 km with gravel pavement. General layout is shown in Figure IV.6.

4.12.3 Upper Kapheu Scheme

Water resource for irrigation development is the Kapheu river, and concrete diversion weir is planed to construct at about 1.5 km upstream from B. Sixiangmai. Height of weir is 3.5 m and a width is 14 m. Irrigation water is conveyed to an area of 1,000 ha by main and secondary canal networks of about 14 km. Main canal networks consist of 2 main canals, 3 secondary canals and tertiary canals, 4 impounding ponds with total effective capacities of about 395,000 m³ and related structures. Canal lining is planed to provide about 21 km in main and secondary canal networks. Main crops to be irrigated are coffee, upland crops and wet season paddy. Main and secondary drains networks compose of 6 secondary drain of about 1.1 km in length. Farm road networks including inspection road of canals are laid out about 16 km with gravel pavement. General layout is shown in Figure IV.7.

4.12.4 Lower Xe Set Scheme

Irrigation water is off-taken about 2 km downstream from Xe Set power station by concrete diversion weir with a height of 11.5 m and a width of 75 m and regulated by storing water in pond which is laid out at just downstream from the diversion weir in order to deal with the released discharge from the Xe Set hydro-power station. Irrigation area is 1,000 ha, and main crops are paddy and upland crops. Main canal networks consist of 3 main canals and 5 secondary canals, farm ponds and related structures. The length of main canal networks is about 15 km. Main drain networks of about 8 km consist of 4 secondary drains and related structures. Road networks including inspection road are planed about 26 km with gravel pavement. General layout is shown in Figure IV.8.

4.12.5 Upper Tay-Un Scheme

Water resources for irrigation development is 2 rivers, namely, the Tay-Un river and the Thon river, and small impounding ponds are planed to construct at each the river basin. Irrigation water is conveyed to the irrigation area of approximately 330 ha by main canal networks of about 5 km in a total length. A regulation pond is planed to construct along main canal stretched from the H. Tay-Un river. An effective storage capacity of the regulation pond is about 65,000 m³. Irrigation areas are 330 ha of paddy in wet season and about 190 ha of upland crops in the dry season. Main drain networks is planed to layout about 100 m in a total length, and farm road networks of about 5 km including inspection roads are planed with a gravel pavement. General layout is shown in Figure IV.9.

5 DESIGN

5.1 Design Standard

Design standards on earthfill dam, impounding pond, diversion weir and irrigation and drainage canals and related structure are adopted based on the standards issued by the Ministry of Agriculture, Forestry and Fishery, Japan.

5.2 Design Concept

Irrigation and drainage facilities are designed based on the following concept, taking into consideration present natural, social and environmental conditions of the respective schemes.

(1) Irrigation and drainage facilities for easy O & M works

Except for diversion weir and earthfill, irrigation and drainage facilities are designed to aim at easy O & M works. For easy maintenance works, irrigation canal and farm pond are designed to be lined by pre-cast concrete blocks to sustain easy production of concrete blocks and easy maintenance of canal section by water users' group in future maintenance stage. For more easy operation, simple facilities such as broad crest weir of discharge measuring structures and vertical type of intake tower with sluice gates for impounding pond are designed. Water level of farm pond is also designed to control by using side spillway.

(2) Irrigation and drainage facilities taking into account soil conservation

For soil conservation, the facilities to protect soil erosion in farm plot and along drainage canal are designed. The facilities are designed to be low cost, easy maintenance and no technology for maintenance. The facilities are farm bund combined with an alley cultivation and boulder drop structure.

5.3 Irrigation and Drainage Flow Chart

Chart flow of irrigation and drainage canals are shown in Figures IV.10 to IV. 19. Design discharges of canal and drain are multiplied irrigation area by the peak irrigation requirement of the each crop in the each scheme.

5.4 Design Discharge

(1) Design Discharge of Irrigation Canals

Irrigation water supply is scheduled to be 24 hour - supply for paddy field and 12 hour-supply during the peak requirement for upland crops, vegetables and orchards. Irrigation discharge of the each canal is multiplied irrigation area by the peak irrigation requirement of paddy, upland crops and coffee. Design discharge is determined to take into consideration the peak water requirement for each crop and rotation of water supply. Design discharge of main, secondary and irrigation canals are estimated in the each scheme area as shown below.

- (i) Upper Champi Scheme
 Main and Secondary Irrigation Canal Q=0.004 m³/s to 0.153 m³/s
 Tentiary Irrigation Canal Q=0.003 m³/s to 0.043 m³/s
- (ii) Upper Tapoung Scheme
 Main and Secondary Irrigation Canal Q=0.009 m³/s to 0.035 m³/s

	Tertiary Irrigation Canal	$Q=0.018 \text{ m}^3/\text{s}$ to $0.038 \text{ m}^3/\text{s}$
(iii)	Upper Kapheu Scheme Main and Secondary Irrigation Canal Tertiary Irrigation Canal	Q=0.004 m ³ /s to 0.275 m ³ /s Q=0.006 m ³ /s to 0.038 m ³ /s
(iv)	Lower Xe Set Scheme Main and Secondary Irrigation Canal Tertiary Irrigation Canal	Q=0.032 m ³ /s to 3.300 m ³ /s Q=0.018 m ³ /s to 0.219 m ³ /s
(v)	Upper Tay-Un Scheme Main and Secondary Irrigation Canal Tertiary Irrigation Canal	Q=0.036 m ³ /s to 0.489 m ³ /s Q=0.006 m ³ /s to 0.181 m ³ /s

(2) Flood Design Discharge of Diversion Weir and Dam

Design flood discharge are basically provable flood discharge with a return period of 5-year for diversion weir and that of 30-year for dam spillway. However, design flood discharge of Tay-Un dam No.2 is determined as provable flood discharge of 100 - year taking into consideration village areas, namely B. Chakamlit and profitable agriculture land. The design flood discharges of each diversion weir and dam spillway are determined as follows.

- (i) Upper Champi Intake weir Q=102.2 m³/s Dam No.1 Q=19.6 m³/s
- (ii) Upper Tapoung
 Intake weir Q=33.6 m³/s
- (iii) Upper Kapheu
 Intake weir Q=122.0 m³/s
 Dam No.1 Q=1.3 m³/s
 Dam No.2 Q=5.1 m³/s
 Dam No.3 Q=5.6 m³/s
 Dam No.4 Q=3.4 m³/s
- (iv) Lower Xe Set
 Intake weir O=1042.0 m³/s
- (v) Upper Tay-Un

 Dam No.1 Q=138.0 m³/s

 Dam No.2 Q=61.1 m³/s

 Dam No.3 Q=1.6 m³/s

(3) Design Discharge of drains

Design discharges of drain in the each scheme is estimated as follows.

(i) Upper Champi Secondary Drains Q=0.121 m³/s to 1.136 m³/s Tertiary Drains $Q=0.027 \text{ m}^3/\text{s}$ to 1.011 m³/s

(ii) Upper Tapoung

Secondary Drains Q=1.865 m³/s Tertiary Drains Q=0.320 m³/s to 1.636 m³/s

(iii) Upper Kapheu

Secondary Drains Q=0.135 m³/s to 0.616 m³/s Tertiary Drains Q=0.022 m³/s to 0.878 m³/s

(iv) Lower Xe Set

Secondary Drains Q=0.225 m³/s to 1.876 m³/s Tertiary Drains Q=0.073 m³/s to 0.933 m³/s

(v) Upper Tay-Un

Secondary Drains Q=0.067 m³/s Tertiary Drains Q=0.005 m³/s to 0.198 m³/s

5.5 Design of Canals, Drains and Roads

Irrigation canal has a trapezoidal section, and inside slope of canal is 1:1.5. Canal lining is expanded from main and secondary canals by concrete block. Type of concrete block is pre cast concrete blocks which is made near the construction sites, and 3 types of concrete blocks such as type-1, 100 (L) x 300 (W) x 7 (t) cm, type-2, 100 (L) x 200 (W) x 7 (t) cm and type-3, foot type are designed. Thickness of concrete blocks is 7 cm. Weephole is designed to provide in excavation section of canals.

Maximum velocity on canal is determined 0.9 m/sec. for concrete lining and 0.6 m/sec. for earth canal taking into consideration stable hydraulic flow and prevent soil erosion. Minimum velocity of canal is determined 0.45 m/sec. to prevent aquatic plants' growth and siltation.

Drainage canal's earth canal with trapezoidal section, and inside slope is designed to be 1:1.5. Maximum velocity of drain is deigned 0.9 m sec. during peak discharge to prevent soil erosion.

Roughness coefficient (n) of canals are determined as follow.

Concrete lining n = 0.015Earth canal n = 0.03

Free board of canal (F) is determined by the following formula.

 $F>0.05 \times h+(V^2/(2 \times g))+0.1$

Inspection roads with a gravel pavement are laid out along canals and drains. Inspection road are broadly divided into two (2) types, namely, Type A and Type B. Type A is provided along main and secondary canals. Total and effective widths of Type A road are respectively 5 m and 3 m. Those of Type B are 3.5 m and 2.5 m respectively. The pavement is 15 cm in thickness. Farm road is designed to link these inspection road in order to intensify the effective function of canal inspection and regional transportation. Outside slope of road is 1: 1.5 and shoulder portion and outside slope of the road is designed to cover by sod facing.

Typical sections of canal, drain and road are shown in Figure IV.20.

5.6 Design of Major Structures

(1) Dam

Barthfill dam is homogeneous type, and riprap of 1 m in thickness is provided at surface of upstream slope. Dam which dam height is more than 10 m is designed to provide toe drain consisting of stone and sand filter. slopes of upper and down stream sides are basically determined to divided into 2 cases. In case of dam which dam height is less than 10 m, both the slopes are 1:2.5, and in case of dam height is more than 10 m, slope of upper stream side is 1:3.0 and the slope of down stream side is 1:2.5.

Flood discharge is designed to spill out through intake tower of duck bill type and flood way. As for dam No.1 & dam No.2 in the Upper Tay-Un, flood discharge is designed to spill out through side spillway and intake tower. Major dimension of each dam are as follows. Typical section of dams are illustrated in Figures IV.21 to IV.22 as sample drawings.

Scheme	Name	Width of	Length of	River	F.W.L	H.W.L	L.W.L
	of Dam	Crest (m)	Crest (m)	Bed EL.			
Upper Champi	Dam No. I	6.0	30.0	1170.00	1185.00	1184.00	1174.00
Upper Kapheu	Dam No. I	4.0	140.0	677.50	684.50	684.00	678.00
ditto	Dam No.2	4.0	190.0	671.50	676.50	676.00	672.00
ditto	Dam No.3	4.0	170.0	661.50	666.50	666.00	662.00
ditto	Dam No.4	4.0	150.0	655.50	662.50	662.00	656.00
Upper Tay-Un	Dam No.1	6.0	155.0	608.50	616.00	614.50	614.00
ditto	Dam No.2	6.0	305.0	602.00	609.00	608.00	604.00
ditto	Dam No.3	4.0	200.0	608.10	610.50	610.00	609.00

Scheme	Name	Elevation	Elevation	Slope of	Slope of
	of Dam	of Crest	of Drain	Inside	Outside
Upper Champi	Dam No. 1	1186.00	1175.00	1.3.0	1:2.0
Upper Kapheu	Dam No. I	685.50	none	1:2.5	1:2.5
ditto	Dan No.2	677.50	none	1:2.5	1:2.5
ditto	Dam No.3	667.50	none	1:2.5	1:2.5
ditto	Dam No.4	663.50	none	1.2.5	1:2.5
Upper Tay-Un	Dam No. I	617.00	611.00	1:3.0	1:2.0
ditto	Dam No.2	610.00	605.00	1:3.0	1:2.0
ditto	Dam No.3	611.50	none	1:2.5	1:2.5

(2) Diversion Weir

Diversion weir is broad crest concrete weir, and height of retaining walls is designed to add freeboard to high water level during design flood. Design flood discharge is designed to spill out through main weir body. Scouring sluice Crest length of weir is basically determined to sustain width of existing river, and dimension of scouring sluice is designed to flush out boulders of less than 0.5 m, and length of scouring sluice is designed to be of less than half of the length.

Settling basin is provided in the Upper Champi and Upper Kapheu Schemes.

Settling basin is designed to provide at immediately down stream of intake structure, if wide and opened land is available. Dimension of settling basin is designed to occur siltation of the particles of minimum 0.3 mm. Dimension of each settling basin are as follows. Typical section of diversion weir is illustrated in Figure IV. 23.

Scheme	Length of Crest (m)	River Bed EL.	H.W.L	Elevation of Crest	Elevation of Intake	
Upper Champi	43.0	1218.00	1224.60	1223.50	1223.00	3.0 m
Upper Tapoung	38.0	1221.50	1226.60	1226.00	1225.00	2.5 m
Upper Kapheu	14.0	794.50	798.60	796.00	795.50	1.5 m
Lower Xe Set	75.0	367.50	378.00	374.50	374.00	5.0 m

Scheme	Length of Upper Apron(m)	Length of Lower Apron(m)	Length of Ripmp (m)
Upper Champi	13.0	19.0	30.0
Upper Tapoung	10.5	12.0	10.0
Upper Kapheu	9.0	7.0	15.0
Lower Xe Set	14.5	26.5	45.0

(3) Intake Structure

Intake structure is divided into 2 types such as intake gate of weir and intake tower of dam. Intake structure consists of gate and steel screen. Dimension of intake gate is 0.6 m (H) x 0.6 m (B) taking into consideration manual operation of gate and maintenance works. Intake tower is concrete tower of duck bill type, and water is off - taken through sluice gates which are provided about 2 m interval from normal high water level of reservoir.

The other type of intake structures is provided in order to off - take water for domestic water supply at diversion weirs of Upper Champi, Upper Kapheu and Lower Xe Set schemes. Off taking of stable water amount is regulated by gate operation.

(4) Regulation Pond

For adjustment of water supply from hydro-power station in the Xe Set Scheme during the peak hydro-power operation system in dry season, concrete lined regulation pond which an effective capacity is 130, 000 m3 is provided. Regulation pond is earthfill type, and outside slope of embankment is designed to covered by sod facing in order to prevent soil erosion. Dimension of regulation pond is as follows. Typical section of regulation pond is illustrated in Figure IV.24.

Crest width of embankment	2.0 m
Side slope of embankment	1:1.5
Thickness of concrete lining at slope	0.07 cm
Thickness of concrete lining at bottom	0.15 cm
Effective water depth	2.0 m
Free board	1.0 m

(5) Farm Pond

farm pond is provided at head section of tertiary canal which the command area is covered by upland crops, coffee and tea to adjust time - lag of water supply among main to

tertiary canals and water supply amount for tertiary canal. Farm pond is earthfill type of rectangular size, and 8 types of farm ponds are designed as shown below, depending topographical condition. Dimension of farm pond are basically as follows. Typical section of regulation pond is illustrated in Figure IV.24.

Crest width of embankment	1.0 m
Side slope of embankment	1:1.5
Thickness of concrete lining at slope	0.07 cm
Thickness of concrete lining at bottom	0.10 cm
Effective water depth	-1.0 m
Free board	0.7 m

Type		mension		Type	Basic Dimension					
	Width (m)	Volume (m³)			Width (m)	Volume (m³)				
1	15	225		5	35	1,225				
2	20	400	-	6	40	1,600				
3	25	625		7	45	2,025				
4	30	900		8	50	2,500				

(6) Turnout and Measuring Devices

Turnout is provided at off branching point of main and secondary canals, and 5 types of turnouts are designed depending to elevation of mother canal base as shown below. Turnout consists of inlet transition, conduit and out let transition sections. Conduit section is designed as reinforced concrete box because of thin earth covering. For maintenance works of turnout, specially, conduit section, concrete beam of concrete box is designed to open. Measuring device is also designed to provide immediately down stream of turnout as board crest weir. Typical sections of turnout and measuring devices are shown in Figures IV.24 to IV.25.

Type	[Inl	et		rrel	Outlet				
1	Basehight(m)	Length (m)	Width (m)	Height (m)	Width (m)	Height (m)			
i	0.3	1.10	0.30	0.50	0.50	1.90			
2	0.4	1.25	0.30	0.50	0.50	1.90			
3	0.5	1.40	0.30	0.50	0.50	1.90			
4	0.6	1.55	0.30	0.50	0.50	1.90			
5	0.7	1.70	0.30	0.50	0.50	1.90			

(7) Impact Box

For stable distribution of irrigation water to lower grade canal through turnout in steep gradient section of main and secondary canals, impact box is provided to dissipate hydraulic energy in transition section from unsteady flow at steep gradient section to steady flow at gentle gradient section. Impact box is provided 3 types shown below. Typical sections of impact box are shown in Figeure IV.24 to IV.25.

Type	Discharge (m³/sec)	Width (m)	Length (m)
1	less than 0.10	1.00	1.50
2	from 0.10 to 1.00	1.50	2.00
3	more than 1.00	2.50	3.50

(8) Drop

Drops of 2 types, namely inclined drop and vertical drop, are provided depending to

gradient of canals and discharge. Dimension of drops are as follows. Typical sections are shown in Figures IV. 24 to IV.25.

Inclined Drop

		Leng	th (m)	Basewidth(m)	Wall height (m)				
	Inlet	Chute	Energy	Outlet	Chute &	Chute	Energy		
	transition	section	dissipater	transition	Dissipator	section	dissipator		
i	3.00	4.00	2.00	0.80	0.50	0.30	0.80		

Vertical Drop

		citical Diop	
Design discharge	Settling basin length	Settling basin width	Depth of water cushion
less than 1.0 m³/sec	3.50 m	2.50 m	0.35 m
more than 1.0 m³/sec	6.00 m	2.50 m	0.80 m

(9) Culvert

Box culvert and pipe culvert are deigned for irrigation and drain respectively. Box culvert is divided into 2 types such as single conduit and 2 conduits types depending to design discharge. Pipe culvert provided for drain is also divided into 2 types as shown below. Typical sections are also shown in Figures IV. 24 to IV.25.

Γ	Type	Barre	l (m)	Type	Barre	l (m)
		Width	Height		Width	Height
		Single Barrel			Double Barrel	
	1	0.40	0.40	10	0.90	0.50
	2	0.60	0.40	11	1.10	0.60
	3	0.80	0.40	12	1.30	0.80
	4	0.90	0.50	13	1.60	0.80
	5	1.00	0.50	14	2.00	1.00
	6	1.10	0.60		Pipe Barrel	
	7	1.30	0.80	P-1	Dia. 90)0 ກາກ
	8	1.60	0.80	P-2	Dia. 1,0	00 mm
	9	2.00	1.00			1

(10) Gabion mattress at confluence points with drain and canal

Tertiary drain is designed directly to connect with tertiary drain in order to evacuate excess water to be conveyed from irrigation canal system. However, since connection section between tertiary canal and tertiary drain is generally steep, gabion mattress is designed to construct by using boulder collected at site.

On the other hand, other type of gabion mattress of 15 m is designed to provide at confluence point among drains.

5.7 Design of On - farm Facilities

(1) Canal Layout

On - farm development facilities consists of tertiary and quarterly canals, tertiary and quarterly drains and related structures. Tertiary canal of about 40 % is designed to be concrete lined canal, and quarterly canal is earth canal. Unit command area of tertiary canal is basically 20 ha. Typical canal layout of on-farm development is shown in Figures IV.27 to IV.29.

(2) Land Preparatory Works

land preparation works such as rough land grading works including clearing and stripping works are designed. As for land preparation of paddy field, rough leveling work is also designed.

(3) Farm Bund

For soil conservation, farm bund involving alley cultivation is designed as described in section 4.10.

Tables

Table 1V.1 (1/3) UNIT IRRIGATION WATER REQUIREMENT (CHAMPI) Rainfall: Paksong ET Data: Paksong Condition: lng. Spox irrigation (20mm) 2 weeks before flowering and one month irrigation after flowering Max. Apt May June July Aug. Sept Oct. Dec CROPPING PATTERN - C Vegetable Vegetable COFFEE I month ferination after Flowerine Snot Injustion before Playering 268.5 117.0 289.9 690.8 464 179.0 540 2,624.9 Monthly Painfall 154.0 144.0 170.0 123.7 116.0 135.0 1.690.0 Potential Evapo-transpiration (Paksong) 128.0 150.0 174.0 152.6 126.0 124.0 204.1 138.1 214.3 213.5 297.9 266.8 154.3 1,725.9 1.6.1 Effective Rainfall (Paddy) 1.4 29.5 140.0 140.0 119. 40.6 1,126.7 Effective Reinfall (Upland Crops) CROPPING PATTERN - C Vegetable 0.65 93.6 0.85 Crop Coefficient (Kc) 0.70 0.78 0.7 0.82 0.75 **7**98 131.8 142.1 94.5 Crop Evapo-transpiration (Elecop) 89.6 117.5 1.3 25. 105 9 120.7 40.6 574 Effective Rainfall 0.17 0.50 0.8 10 0.83 0.50 0.17 Area Factor 173 Net brigation Requirement 24 18 Upland Crops 0.92 0.93 0.9 0.83 0.8 0.75 Crop Coefficient (Ke) 102.3 102.5 107.3 124.9 130.9 662 94.5 Top Evapo-transpiration (ETctop) 140.0 0.75 140.0 693 140.0 138.1 119.5 £4.5 Effective Rainfall 0.75 0 25 0.25 1.0 33 Net Irrigation Requirement 0.51 0.51 0.51 0.51 0.5 0.51 0.5 0.51 0.51 0.51 Inigation Efficiency 0.51 0.51 Conveyance Efficiency \$5 4 Application Efficiency 60 % of upland crops 404 51 51 35 0.13 149 Gross Irrigation Requirement 87 0.19 0.03 0.22 0.07 Coffee 0.6 0.65 0.65 0.65 0.63 0.65 87.8 0.65 0.6 Crop Coefficient (Kc) 1,099 Crop Evapo-transpiration (ETcrop) Effective Rainfall B3 . 98.8 80.6 76. 100.1 93.6 97.5 110.5 113.0 81.9 75. 40.6 0.17 25.7 0.33 t05.9 120. \$40.1 140.0 140.0 140.0 138.1 119.5 14.5 1,127 0.17 Area Factor Flowering Water 6.60 6.66 57 33. 218 1.5 Net Irrigation Requirement 0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.60 0.50 Inigation Efficiency 0.60 0.60 Conveyance Efficiency 85 % Application Efficiency 70 % **9**6 Gross Irrigation Requirement 0.01 (lit/sec/ha 0.21 0.15 Rainfall (Fakxong) 4.028. 0.3 69.5 234.0 264.0 551.1 9586 1 718.7 488.2 153.7 0.2 8.4 9.6 23.8 3,241.3 211.2 856.7 566.6 836.8 373.3 125.3 1992 45 () 11.8 41.0 130.2 758.4 594.9 8.9 67.2 2.60L 522.5 392.4 57.9 80.2 4.1 1993 53.7 4,252.5 506.2 1994 0.6 48.4 318 2 292.1 374.7 500.9 1.213.8 E81.8 2 624 9 268.5 179.6 20.1 291.3 690.B 1991 31.7 145.5 183.1 289.9 Monthly Unit Irrigation Requirement by Y CROPPING PATTERN - C 0.08 0.25 2.10 0.27 0.79 0.59 0.01 0.12 0.54 COFFEE 0.15 0.27 CROPPING PATTERN - C 0.23 0 29 0.00 0.18 0.09 2.13 0.73 0.21 0.08 0.41 COFFEE 0.08 0.23 0.02 CROPPING PATTERN - C 0.45 0.14 011 0.33 0.77 0.75 021 0.17 0.61 COFFEE 0.21 0.26 0.02 0.17 CROPPING PATTERN - C 0.33 0.03 0.01 0 09 1.14 0.55

COFFEE

COFFEE

CROPPING PATTERN - C

021

0.32

021

0.10

0.62

0.15

0.10

013

0.32

0.37

0 07

0.01

0.03

0.22

Table IV.1 (2/3) IRRIGATION WATER REQUIREMENT (UPPER CHMPI SCHEME)

all : Pakaong

ition: 3 month time lag. Spot irrigation (30mm) 2 weeks before flowering and one month irrigation after flowering

	with Storage I	Feb.	Mar.	Vor.	May	June	My	Aug.	Sept	Oct	Nov.	Dec	Total
Basic Data : Irrigation Unit					viay	, 100c	1 1019	L Vale	1 × 1	1 000	1.004.	Dec	HOLAR
1986 C Pattern A	1.08	1.43	1.12						 -			0.18	T
C.Pattern 8.2	0.65	0.97	0.55	0.14								0.33	
C.Patera - C	0.33	0.70	0.43	0.15							0.20	0.10	
Coffee	621	0.70	0.13	0.43							0.20	0.09	
1987 C.Patters - A	1.08	1.53	1.33								0.09	0.29	
CPaters - B.2	0.65	1.07	0.76	0.06							0.09	0.29	
C.Pattera - C	0.33	0.79	0.65	0.02							0.25	0.12	
Coffee		0.19	0.00	0.02							0.23		
	0.21	0.84										0.14	
1988 C.Patters - A	0.93		1.44	200							0.02	0.29	
C.Pattera - B 2	0.52	0.36	0.86	0.06							0.04	0.38	
C Pattern - C	0.25	0.20	0.76	0.01							0.23	0.12	
Coffee	0.13		0.03									0 14	
1989 C.Pattera · A	1.02	1.53	1.13									0.28	
C.Pattern · B 2	0.59	1.07	0.56	0.06								0.38	
C.Pattern C	0.30	0.79	0.44	0.01							0.16	0.12	
Coffee	0.18	0.27					:					0.14	
1990 C.Pattera - A	1 08	1.53	1.08	0.19								0.29	
C.Pattern - B 2	0.65	1.07	0.52	0.21								0.38	
C.Patters · C	0.33	0.79	0.39	0.26							0.20	0.12	1
Coffee	0.21	0.27										0.14	
1991 C Pattern A	0.96	1.53	1.27								0.09	0.24	Γ
C.Pattern B.2	0.54	1.07	0.70	0.06							0.20	0.36	
C.Pattera C	0 27	0.79	0.59	0.01						0.08	0.25	0.11	
Coffee	0.15	0.27		:								0.12	1
1992 C.Pattern A	0.84	1.47	1.42	0.22						0.04	0.04	0.16	
C fatters - B 2	0.43	1.00	0.84	0.23						0.04	0.08	0.32	
C.Pattern C	0.21	0.73	0.24	0.29	0.00					0.18	0.23	0.09	1
Coffee	0.08	0.23	0.02								:	0.08	1
1993 C Pattern - A	1.08	1.51	1.43	0.11						0.40)	0.24	1
C.Pattern B.2	0.65	1.05	0.85	0.18						0.40		0.36	
C.Pattern - C	0.33	0.71	0.75	0.21						0.45		0.11	
Coffce	0.21	0.26	0.02			•				-1.4	•.••	0.12	
1994 C.Pattera - A	1.07	1 25	0.24								-		
C.Pattern B.2	0.64	0.78	0.09	0.06			٠.					0.20	1
C Pattern - C	0.33	0.55		0.01						0.03	0.17	0.66	
Coffee	0.21	0.10								- 100	*.**		i
1995 C.Pattern - A	1.07	1.33	0.87										1
C.Pattern - B 2	0.64	0.87	0.32	0.14								0 23	1
Centera - C	0.32	0.62	0.19	0.13						0.03	0.22	0.07	
Coffee	0.21	0.15	0.19	0.13						V.VJ	V.11	0.01	

WATER DEFICIT FOR IRRIGATION OF PLANNED CROPPING AREA

Cropping Area	(ha)
C.Pattern - A	
C.Pattern - B.2	:
C.Pattern - C	
Coffee	570
Total	570

	Jan.	Feb.	Mar.	Apr		1ay	June	Ti	ıly F	Aug.	1	Sept	1 00	īΤ	Nov.	Dec	Total
Irrigation Requirement	m3./sec.		1					-L					1				(MCM)
1986	0.122	0.120														0.053	
1987		0.154				:		:								0.079	
1988	0.074		0.015													0.079	
1989	0.192	0.154														0.075	
1990	0.522	0.154														0.079	
1991	0.084	0.153														0.068	
1992	0.043	0.131	0.011													0.049	0.589
1993	0.122	0.146	0.012													0.063	
1994	151.0	0.060															0.458
1995	0.119	0.086														0.00	0.545
Deficia .	m3/sec.																
1986	1																1
1987																	
1988																	
1989		0.000															0.001
1990	ł																
1991																	
. 1992																	
1993	ŀ																
1991	ŀ																i
1995					<u> </u>												l
					·												
Days of meads	31	28	31	3	0	31	34	<u> </u>	31	3	11	3	0	31	30) . 31	
Deficit	cu.m																
1986																	İ
1987																	:
1988																	1
1989		1,163															1,163
1990																	1
1991																	
1992																	
1993																	l .
1994																-	l .
1995																	i

Table IV. 1 (V3) IRRIGATION WATER REQUIREMENT (UPPER CHMPI SCHEME)
fall: Pakxong
fition: The Data: Pakxong
3 mouth time (ag. Spot irrigation (20num) 2 weeks before flowering and one mouth irrigation after flowering

Rainfall : Pakxong

	with Storage	Poba (elles Feb.	Mar.	Apr.	May	June	July	Aog.	Sept	Oct.	Nov.	Dec	Total
Basic Data : Irrigation Un													
1986 C Pattern A	1.08	1.43	1 12									0.18	
C Pattern - B 2	0.65	0.97	0.55	0.14								0.33	
C.Pattern - C	0.33	0.70	0.43	0.15							0.20	0.10	
Coffee	0.21	0.21	0.00	•								0.09	
1987 C.Patters A	1.08	1.5	1.33								0.09	0.29	
C.Pattern B.2	0.63	1.07	0.76	0.06							0.20	0.38	
C.Pattern C	0.33	0.79	0.65	0.02							0.25	0.12	
Coffee	0.21	0.27										0.14	
1988 C.Pattern - A	0.93	0.84	1.44								0.02	0.29	
C.Pattern B.2	0.52	0.36	0.86	0.06							0.04	`0.38	
C.Pattern C	9.25	0.20		0.01							0.23	0.12	
Coffee	0.13	0.10	0.03									0.14	
1989 C.Pattern · A	1.02	1.53	1.13									0.28	i
C.Pattern - B.2	0.59	107	0.56	0.06								0.38	
C.Paltern C	0.30	0.79	0.44	0.01							0.16	0.12	
Coffee	0.18	0.27	0.17	0.61								0.14	
1990 C.Pattern - A	1.08	1.53	.1.08	0 19								0.29	
C.Pattern - B.2	0.65	1.07	0.52	0.21								0.38	1
C.Pattern - C	0.33	0.79	0.32	0.26							0.20	0.12	
Coffee	0.21	0.27	. 0.37	V.20								0.14	
1991 C.Pattern - A											0.09	0.24	
C.Pattern - B 2	0.96	1.53 1.07	1.27 0.70	0.06							0.20	0.36	
C.Pattera - C	0.54	0.79	0.59	0.03						0.08	0 25	0.11	
Coffee	0.27	0.79	0.39	0.03						0.00	~~~	0.12	
1992 C.Pattern - A		1.47		0.22						0.04	0.04	0.16	
C.Pattern - B.2	0.84	1.00	1.42 0.84	0.23						0.04	0.06	0.32	
C.Pattern - C	0.43	0.73	0.74	0.29	0.00					0.16	0.23	0.09	
Coffee	0.08	0.73	0.02	0.29	0.00					V.10	0.25	0.08	
1993 C.Pattern - A			1.43	011						0.40		0.24	
C.Pattera - B.2	1.08	1.51 1.05	0.85	0.18						0.40		0.36	
C. Pattera - C	0.65	9.77	0.85	021						0.45	0.14	0.11	
Coffee	0.33	0.26	0.02	V.21						• •		0.12	
1994 C.Pattern - A	1.07	1.25	0.02			 ;							
C Pattern - B.2	0.64		0.09	0.06								0.20	ł
C.Patters - C	0.64			0.00						0.03	0.17	0.05	
Coffee	0.33	0.10		V.01						4.55			•
1995 C.Pattern - A	1.07	1.33	0.87					 :			-		t
C.Pattern - B.2	0.64	0.87		0.14								0.23	1
C.Pattern - C	0.67	0.62	0.32	0.14						0.03	0 22	0.07	
Coffee	0.32	0.62	A:13	Ų.13						5.05		0.01	1

WATER DEFICIT FOR IRRIGATION OF PLANNED CROPPING AREA

Cropping Area	(ha)
C.Pattern A	
C Pattern - B 2	1
C.Pattern C	110
Coffee	50
Total	160

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug		Scot	Oct.	Nov.	Dec	Total
lerigation Requirement	m3/sec.	· · · · · · · · · · · · · · · · · · ·				:								(MCM)
198		0.088	0.048	0.016								0.022	0.016	
198			0.071	0.002					:	. *		0.027	0.020	
198		0.022	0.085	0.008								0.025	0.020	
198			0.049	0.001								0.017	0.020	
199	0.047	0.100	0.043	0.029								0.022	0.020	
199		0.100	0.065	0.001							0.009	0.027	0.018	
199		0.092	0.083	0.032	0.000						0.019	0.026	0.015	
199		0.097	0.083	0.023							0.050	0.015	0.018	
199	0.047	0.066		0.001							0.003	0.019	0.006	
199			0.021	0.015							0.003	0.024	0.008	0.49
Deficit	mVsec.								-					1
198	sl													1
198														1. : .
198														
198	. ا و													
199														
199														
199														1
199														
199														
199	5				. <u> </u>									ļ
													31	
Days of month	31	28	31	30	31	30		<u>. </u>	31	30	31	30	31	l
Deficit	eu.m													
198														1
198														
198														1
198	2]													1
199	0]													I
199	:													
199														1
199														
199						1.								
199				4.4										1

Table 1V.2 (1/2) UNIT ERRIGATION WATER REQUIRESIENT (TAPOUNG)

Rainfall : Pakaong	ET Date: I	Pakxong		٠.			100		•				
Condition:	<u> </u>								irrigation e		P.S.		
	Jan.	Feb.	Mar.	Apr.	Maÿ	June	July	Aug.	Sept	Oct.	Nov.	Dec	
CROPPING BATTERNY O	R. M. M. W. M. M. M. M.	ON THE RESIDENCE OF	2.7.7.7.7.7.7	500mm			entrative della	401430000000000000000000000000000000000	erren ar sensolani			- ZEXX	
CROPPING PATTERN - C	\simeq				N. 1								
		T	2233XXX		****	7777					Alberra.		
		Vegetable						pland Cro	cs			Vegetable	
Monthly Rainfall	1.7	34.7	145.5	183.1	291.3	289.9	690.8	454 8	268.5	179.6	20.1	519	2,624
Potential Evapo-transpiration (Paksong)	128.0	150.0	170.0	174.0	152.0	126.0	124.0	116.0	117.0	135.0			1,690.
Effective Rainfell (PadJy)	1.4	29.5	123.7	156.7	214.1	213.5	297.9	266.8	204.1	154.3	17.1		1,725.
Effective Rainfall (Upland Crops)	1.3	25.7	105.9	120.7	140.1	140.0	140.0	140.0		119.5			1,126.
2.024 a y p 3.00 a y C T mind C 2.03 a y	1	2.4.	155.9	149.11		140.01	170.0	140.0	130.1	317.2	1.7		1,140
10.4										48			
CROPPING PATTERN - C	T					E				· · · · · · · · · · · · · · · · · · ·		1	
Vegetable													
Crop Coefficient (Kc)	0.70	0.78	0.78	0.82	0.85	0.75						0.65	
Crop Evapo transpiration (ETcrop)	89.6	117.5	131.8	1+2.1	129.2	91.5						93.6	19
Effective Rainfall	1.3	25.7	105.9	120.7	140 1	140.0						40.6	57
Area Factor	0.50	0.83	1.00	0.83	0.50	0.17						017	=
Net Irrigation Requirement	44	76	26	18	1							9	17
Upland Crops	l	L		l		l							
Crop Coefficient (Ke)		I				0.75	0.83	0.75	0.90	1.00	0.9		
Crop Evapo-transpiration (ETcrop)		L				94.5	102.3	87.0	105.3	135.0	130.9		65
Effective Rainfall					I	140.0	140.0	140.0	138.1	119.5	14.9		69
Area Factor						0.25	0.75	1.00	1.00	0.75	0 25	l l .	
Net Irrigation Requirement	i				I						29	1	• 4
												ll	
Irrigation Efficiency	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	
Conveyance Efficiency 85 %	L												
Application Efficiency 60 % of upland cr	255 87	1.10									<u>-</u>		
Gross Irrigation Requirement (lit/sec/ha)	0.32	0.62	0.19	0.13						23	57 0.22	18	: 41
funsec.(18)	0.52	V.021	0.19	0.131		<u>-</u> -		I		0.09	0.22	0.07	~
Rainfall (Paktong)													
1986		17.3	97.8	137.9	526.9	391.4	656.9	865.0	370.0	285.7	35.5	19.4	3,443
1987			58.1	281.7	285.6	575.3	642 8	946.4	318.3	238.8	3.7.3		3,350
1988	27.3	1186	38.0	346.3	414.4	368.0	436.4	566.6	338.8	358.2	13.2	- 1	3,025.
1989	11.4		96.2	379.0	374.9	361.4	205.1	524.2	4721	238.8	64.8		3,229.
1990	ł		105.6	135.0	355.1	514.7	404.4	797.4	494.1	271.9	34.5		3,112
1991	21.4	0.3	69.5	294.0	261.0	551.3	958.6	1218.7	488.2	153.7	0.2	8.4	4,028.
1992	45.0	11.8	41.0	130.2	211 2	866.7	566.5	836.8	373.3	125.3	9.6	23.8	3,241.
1993		4. j	40.2	150.6	335.5	251.0	522.5	758.4	3/2.4	57.9	80.2		2,601.
1991	0.6	48.4	318.2	292.1	374.7	500.9	1,213.8	594.9	606.2	181.6	53.7	67.2	4,252
	1.7	34.7	145.5	183.1	291.3	789.9	690.8	464.6	268.5	179.6	20.1	54.9	2,624.
Monthly Unit Irrigation Requirement by Y						·							
1986 CROPPING PATTERN C 1981 CROPPING PATTERN C	83	170	116	38							51	26	49
1988 CROPPING PATTERN - C		191	174	4						1	64	3]	
1989 CROPPING PATTERN C	68 80	48	203	3							59	31	41
1990 CROPPING PATIERN C	88		119							4	41	31	
1991 CROPPING PATTERN C	72	191 191	105	67	 						52	31	53
1992 CROPPINO PATTERN - C	55	177	199	74						<u>37</u>	64 61	29	55
1993 CROPPING PATTERN C	88	186	200	75					·i	136	35	25	65
1994 CROPPING PATTERN - C	87	133		22		}				22	45	15	30
1995 CROPPING PATTERN - C	87	149	51	35						23	57	18	43
		1491	31)	331			1			23	57,	183	·

Table IV.2 (2/2) IRRIGATION WATER REQUIREMENT (TAPOUNG)

ainfall: Paksong	ET Data: Pak												
ondition:	100% Vegetal		Crops, with		ffeitve car) cum)	<u> </u>		;			
	Jan.	Feb	Maz.	Apr.	May	June	July .	Aug	Sept	Oxt	Nov.	Dec	[Un]
asic Data : Irrigation Uni	it Water Requir		ce/ba)			<u> </u>			<u> </u>		· · · · · · · · · · · · · · · · · · ·		
1985 C.Pattern - A	1.08	1.43	1.12									0.18	3.
CPattern · 8.2	0.65	0.97	0.55	0.14								0.33	2.
C Pattern · C	0.33	0.70	0.43	0.15							0.20	0.10	j.
Coffee	. 0.21	0.21										0.09	0.
1987 C.Pattern - A	1.08	1.53	1.33								0.09	0.29	4
C.Pattern - B.2	0.65	1.07	0.76	0.06							0.20	0.38	3
C.Pattern · C	0.33	0.79	0.65	0.02							0.25	0.12	2
Coffee	0.21	0.27										0.14	0
1988 C.Pallem - A	0.93	0.84	1.41								0.02	0.29	3
C.Pattem - B.2	0.52	0.36	0.86	0.06							0.04	0.38	2
C.Pattern - C	0.25	0.20	0.76	0.01							0.23	0.12	1
Coffee	0.13		0.03		. :							0.14	1 : 0
1989 C Paltem - A	1.02	1.53	1.13									0.28	3
C.Pattern - B.2	0.59	1.07	0.56	0.06								0.38	1 :
C.Pattera - C	0.30	0.79	0.44	0.01							0.15	0.12	1 1
Coffee	0 18	0.27	****	****								0.14	
1990 C.Patiem - A	1.08	1.53	1.08	0.19		·						0.29	
C Pattern · B.2	0.65	1.07	0.52	0.11								0.38	
CPutem - C	0.33	0.79	0.39	0.26							0.20	0.12] ;
Coffee	0.33	0.27		0.00								0.14	
1991 C.Pattern - A	0.96	1.53	1.27								0.00	0.24	
C.Pattern - B.2	0.54	1.07	0.70	0.06							0.20	0.36	
C.Pattern - C	0.27	0.79	0.10	0.01						0.08		0.11	
Coffee	0.15	0.27	3.00	0.01								0.12	1 (
1992 C.Pattern - A	0.84	1.47	1.42	0.22						0.04	0.04	0.16	
C.Pattern - B.2	0.43	1.00	0.84	0.23						0.04		0.32	
C.Pattern - C	0.43	0.73	0.74	0.29	0.00					0.18		0.09	
Coffee	0.08	0.73	0.02	0.23	v .50							0.08	
1993 C.Pattern - A	1.08	1.51	1.43	0.11						0.40	·	0.24	
C.Pattern - B.2	0.65	1.05	0.85	0.18						0.40		0.36	
C.Pattern - C	0.83	0.77	0.75	0.21						0.45		0.11	
Coffee	0.33	0.26	0.02	0.21						2.10		0.12	
1994 C Pattern - A	1.07	1.25	0.02										t :
CPattern - B.2	E .	- 0.78	0.24	0.06								0.20	
C.Pattern - C	0.64	0.78	0.09	0.00						0.03	0.17	0.05	
Coffee	0.33	0.10		0.01								4.03	1 8
1995 C.Pattern - A			0.87										
CPattent - B.2	1.07	1.33		0.14								0.23	
C.Pattern - C	0.61	0.87 0.62	0.3 <u>2</u> 0.19	0.14						0.03	0 22	0.07	
Coffee	0.32	0.02	: 0.19	0.13						0.00		. 0.01	
LOHEC	. 921	0.13											2

WATER DEFICITION	IRRIGATION OF PL	ANNED AREA

Planned Are	4 =	80 ba	Feb	Mar.	Apr.	May	June	July	Aug	Scpt	Oct.	Nov.	Dec	Total
raigution Requiremen		m3/sec			I									MCM
usgadoù Redunnen	1986	0.026	0.056	0.035	0.012	4 1						0.016	0.008	
100	1937	0.026	0.053	Q.052	0.001							0.020	0.009	
	1988	0.020	0.005	0.061	0.001						:	0.018	0.009	
	1989	0.024	0.063	0.035	0.001				5		1	0.013	0.009	
	1990	0.026	0.063	0.031	0.021							0.016	0.009	
٠.	1991	0.022	0.063	0.047	0.001						0.007	0.020	0.009	0,43
	1992	0.016	0.059	0.059	0.023	0.000					0.014	0.019	0.008	0.51
	1993	0.036	0.062	0.060	0.017						0.036	0.011	0.009	0.5
	1994		0.044	0.002	0.001						0.002	0.014	0.004	0.2
	1995	0.026	0.049	0.015	0.011						0.002	0.018	0.005	0.33
પ્રતિહોદ સ્થા		m3/sec.	V.2.7.											MCM
AGCII	1986		0.006	0.001										0.0
	1987		0.014	0.020										0.0
	1985		0.011	0.018										0.0
	1989		0.025	0.011										0.0
	1990		0.018	0.601										0.0
	1991		0.014	0.015										0.0
	1992	l	••	0.018										0.0
	1993	i	0.017	0.033										0.1
	1994		0.007											0.0
•	1995		• • • • •											
													·	
Pays of month		31	28	31	30	31	30	3	1 31	30	31	30	31	
Defi cit		CU (N												cu au
	1985		14,145	2,132										16,2
•	1987	1	32,717	54,223										85,9
	1988	1 :		46,988										46,9
	1989		60,263	29,368										89,6
	1990		44,372	2,566										46,9
	1991		32 690	40,104									- 7	72,7
	1992			47,972										47.9
	1993		40,195	87,903				· :						128,0
, ,	1994		16,093					1			:			16,0
<u> </u>	1995	l									<u> </u>			47.5

Table 1V.3 (1/2) IRRIGATION WATER REQUIREMENT (KAPHEU) Rainfall: Lacegam ET Data : Salavan month time lag. Spot Errigation (20mim) 2 weeks before flowering and one month irrigation after flowering. Int. Area Factor, 45, 35 & 20 Jan. Feb. Mar. Age. May June July Aug. Sept. Oct. Nov. Elec Condition of Coffee Irri.: July CROPPING PATTERN - B. 1 WILL Rainy Season Paddy land Crops Upland Crops Eşi COFFEE I month irrigation after Flowering Soot Irrigation before Flowering 358 Monthly Rainfall 24. 140.4 227 225 2173 158.5 1,383 Petratial Evapo transpiration (Salavan) 145. 181.0 219.0 208.0 128.0 182.3 140.0 177.9 158.0 134.5 192.0 141.0 147.0 162.0 151.0 1979.0 Effective Rainfall (Paddy) 20.7 10.2 Effective Rainfall (Coland Crops) 9.0 18.9 103.4 132.1 140.0 131 ; 129.9 CROPPING PATIERN - B.I Upland Crops 0.78 0.88 Crop Coefficient (Ke) 0.90 0.84 0.X 0.7 0.73 Crop Evapo transpiration (ETcrop) 113.6 159.9 197.1 187.2 159.2 1.040 109.5 313.4 Effective Rainfall 9.5 18.0 103.4 145 Arca Factor 0.90 1.00 0.94 0.50 0.00 0.05 0.40 570 Net Irrigation Requirement 15 18 41 Rolny Season Paddy Crop Coefficient (Ke) 0.9. 1.0 0.9 1.20 (rop Evapo-transpiration (Efcrop) 126. 139. 134.4 158.7 189.5 166.3 936 64 134.7 Percolation 60.0 183. 6 6 60 177.9 60 10.2 372 1193 238.6 Effective Rainfall 182.3 1,047 0.0 0.5 0.9 09 0. 0.06 Publishing Water 79 169 Nursery Water 21 Net Irrigation Requirement 28 36 Imgation Efficiency 0.51 0.5 0.51 0.51 0.51/0.6 0.6 0.0 0.6/0.51 0.5 Conveyance Efficiency B5 % Application Efficiency 70 % of paddy field, 60 % of upland cro Gross Irrigation Requirement 166 25 1,178 0.32 0.64 0.18 0.03 0.07 COFFEE Crop Coefficient (Ke) 0.65 0.65 0.65 0.65 Crop Evapo transpiration (ETerop) Effective Rainfall 91.7 132.1 94. 117.7 142.4 135.2 129.4 95.0 83 2 91.0 102.7 105.3 1.286 99 7 9.0 18.0 103.4 131.5 110 129.9 111.6 8.9 790 0.28 0.10 02 Dowering Water 7.0 4.00 9.00 Net Irrigation Requirement 44.1 Ū3 118 30.5 31.1 0.60 0.60 0.60 Irrigation Efficiency 0.60 0.60 0.60 0.60 0 60 0.60 0.60 0.60 0.60 aveyance Efficiency 85 % Application Efficiency 70 % Gross Irrigation Requirement 199 (lit/sec/b) 0.28 0.21 0.07 0.20 Rainfall (Leongant) 100 11.5 346.7 429.3 186.2 23.7 12.5 2,250.6 198 38.7 187.4 1838 370.6 419.0 600.0 210.4 158.4 2,168.4 1988 18.8 77.9 271.4 243.3 287.0 372.3 228.0 223.3 215.9 8.8 1.991.5 1989 18 8 616 183.6 440.3 193.1 402.7 273.5 186.1 128.7 0.8 1,889.2 1920 0.5 0.8 126.1 71.7 238.4 305.0 292.0 367.4 233.2 212 9 22.6 1.876.5 1991 0.4 0.3 26.3 207.8 259.8 4[4.9 560.9 301.5 266.2 0.1 5.5 2.049.5 1992 54.9 5.6 0.6 56.7 214.3 434.8 330.1 5528 332.5 97.3 2,079.7 2.5 1993 37.4 44.2 377.7 261.1 26.3 249.2 42.7 392.9 6.5 1,445.5 1994 1 7 65.9 136.4 218.3 285.7 4.2 110.2 1,841.8 1995 140.4 227.9 358.1 ,<u>383.4</u> Monthly Unit Irrigation Requirement by Year: lit/sec/ha CROPPING PATTERN - B.1 0.75 0.75 1 22 0.07 0.64 0.02 0.32 0.03 0.18 0.07 COFFEE 0.76 1986 CROPPING PATTERN - B. 276 27 76 98. COFFEE 1987 CROPPING PATTERN - B 200 313 310 54 86 52 1,067 COFFEE 1988 CROPPING PA 177 59 200 COFFEE 1989 CROPPING PATTERN-B. 176 58 279 2 1,063 COFFEE 171 1920 CROPPING PATIERN - 8 200 75 312 191 132 86 52 965 187 COFFEE 1991 CROPPING PATIERN - 8 200 75 313 61 1,155 164 83 48 COFFEE 1992 CROPPING PATTERN - B. 125 305 363 24 14 1,138 COFFEE 1993 CROPHNG TERY B 200 75 310 59 312 121 15 144 26 1,360 190 86 52 COFFEE 1994 CROPPING PATTERN - B.1 _____ 200 75 311 60 8 86 52 1,043 COFFEE 1995 CROPPING PATTERN - B 296 52 200 74 16 COFFEE

IRRIGATION WATER REQUIREMENT (UPPER KAPHEU SCHEME)

Table IV.3 (2/2) EF Data : Salavan 3 month time tog. Spot in

	with 3 Starage Po	ade (meal eff	A Te cape.	ty 300,000	cim)		nonth irrigation area tio				- B 1	
	Jan.	Feb	Mar.	Apr.	May	June	July Aug	Sept	Oct	Nov	Pec .	Total
asic Data : irrigetion Unit	Water Requirement	(Dt. Sec. Ba)	<u>:</u>				·	0 18	0.45	962	0 29	
1986 C.Patters - A	100	1.71	1.78	0.93					11.43	0.04	0 29	
C.Patters · B.1	0.75		1 03	0.38	0.01			0.09			0 30	
C Pattern - B 2	0.75		1 63	0.37	0.01			Q.15	0.45	0 64 0 23	0.11	
C Pattera - C	0.37	0.94	. 0.89	0.55	0 11				0-13	0.23		
Coffee	028	0.22									0 16	
1987 C.Pattern - A	100	177	1.92	0.54				0.30	0.60	0.75	0.42	
C.Pattern - B.1	0.75	. 1.30	1.16	0.25	0 02			0.70		0.14	0.32	
C Pattern - B.1	0.75	1.07	1 15	0 24	0.02			0.29	₽ 60	0 77	0.40	
C.Pattern C	0.37		103	0.31	0 15			0.00	0.13	0 26	0 12	
Coffee	0.28		0.01								9.20	
1988 C.Pattern - A	0.90		1.99	0.39				0 26	0 27	0.70	0.42	
	0.56		1 23	0.21	0.01			0 16		0.09	0.32	
C Patters - 8 I	0.56		1.23	0.20	001			0.25	0 27	0.72	0.40	
C Pattern - B 2	0.32		111	0.25	0.11				0.07	0.25	0.12	
C Pattern - C			0.04	. 02.	4.11						0.20	
Coffee	0.22							0.40	0.76	0.75	0.42	
1989 C Pattern - A	0.90		1.80	0.56				0.30	0 13	0.0	0.32	
C Pattern - 8 1	0 64		1 04	0 25	0.61			0.30	0.76	0.77	0.40	
C Pattern - B 2	0.66		1 04	0.24	0.01					0.26	0.12	
C Pattern - C	0.32		0.91	0 32	0.13			0.05	0.38	0.20	0 20	
Coffee	0.22											
1990 C.Patiers - A	1.00	1.77	1.46	1.18				0.22	0 32	0.63	0.42	
C Pattern - B.1	0.75	5 1.29	071	0.5)	0.01			0 12		0.04	0.32	
C Pattern - B 2	0.73	5 117	0.75	0.49	0.01			021	0.32	0.54	0.40	
C.Pattern - C	0.37	7 1.00	0.56	0.77	0.13				0.09	D 23	0 12	
Coffee	0.20	0 25			-			2			0 20	\$
1991 C.Patiere · A	1.00	1.77	2 09	1.43				0.02	6.17	0.75	0.36	1
C Pattern - B.1	0.73		1.33	0.63	10.0					0.14	0.31	1
C Patters - B.2	0.75		. 1.33	0.61	100			0 02	0.17	0.77	0.36	·
C.Patters · C	0.3		1.21	0.99	0.15				0.05	0.26	0.12	l
Coffee	0.2		0.08								9.18	.
			2.12	1 26					0.92	0 75	Q.42	
1902 C.Paitero - A	07			0.55	0.01				0 27	0.14	6.32	
C Pattera - B i	0.44			0.53					0.92	677	0.40	
C.Pattern B 2	0.4		1.36 1.34	0.84					0.41	0 26	012	
C.Pattera - C	0.2			11.54	V: 13				y		0.20	
Coffee	0.00		0.09						3.18	0.72	0.42	
1993 C.Pattern - A	1.0		1 93	1 33		0.50			8.14 8.54	0.10	0.32	
C.Pattern - B.1	0.7		1.37	Q.58		0.49			118	0.73	0.40	
C Pattern - B 1	0.7			0.57		0.48			0.61	0.25	0.40	
C.Pattern · C	0.3			0.90	0.12	0 27	•		0.91	0.23	0.20	
Coffee	0.2			·		····		·			0.42	
1994 C.Pattera - A	10	0 1.76		9.83			0 03		0.85	0.73		
C.Pattern . B.1	07	5 . 1.29	1.02	9.32			_		0.21	0.11	0.32	
C.Pattera - B.2	0.7	5 156		0.31			0.03		0.85	0.75	0.40	
C Patiers . C	. 0.3	7 0.99	0.89	0.45	014				0 35	0 25	0.12	
Coffee	0.2	8 0.25									0.20	
1995 C.Patters - A	1.0			L 44			9.11	0.20	0 60		0.43	
C.Pattera - B I	0.7			0.64	0.02		0 03	0.38		0.07	0.33	
C.Pattern - B.2	0.7			0.62			611	0.27	0.60			1
C Pattern - C	0.3			1.00					5.19	0.24	0.13	
Coffee	0.2							**			0.20)ļ

WATER DEFICIT FOR BRIGATION OF PLANNED CROPPOND ARFA
Cropping Aces
C Pattern - A
C Pattern - B I 100
C Pattern - B 2
C Pattern - B 2
C Pattern - C
Coffice 900
Total 1,000

		Jan	a.	Feb.	Mar.	Ayr. T	May	June	July	Asg.	Sept	Oa.	Nov.		Total
rigation Requirement		n3. sec.		1											(MCM)
	1986		0.327	0.317	0.103	0.638	0.003				0.009		0.004	0 175	25
	1987		0.327	0.357	0.126	0.025	0.002				0.000		0.014	6 208	2.7
	1988		0.263	8 09 E	0.357	0.021	0.001				0.015		0 009	0 208	20
	1989		0 260	0.357	0.104	0.025	0.001				0.030	0.011	0.013	6 208	16
	1990		0.325	0.354	0.071	0.051	0.001				0.612		€ 004	0.208	26
	1991		0.326	0.356	0 203	0.063	0.001						0.614	0.194	2.9
	1992		0.132	0.338	0 216	0.655	0.001					0.027	0.014	0 206	2.5
	1993	ļ	0.327	0.348	0.129	₿ 658	0 (*0)	0 0.19				0.054	0.910	0.208	3.0
+	1994		0.327	0.351	0.102	0.032	0.001					0.021	0.011	0.208	2.7
	1995		0.327	0.315	0.198	0.004	0 002			0 003	0.010		0.007	0.208	2.9
Deficit		m3/sec.													(MCM)
	1986			0.044											0.1
	1987			0.088											0.2
	1938														
	1989	l		0.149											0.3
	1990	l		0.085											0.7
	1991			0 123	8.962										Q-2
	1992	1													
	1993			6119											0.
A	1924		0.034	0.165											0.4
	1995	i		0.011											6.0
															ļ
bys of month			31	28	31	30	31_		31		30	31	30	31	l
Deficit		cu m													195.7
	1956			105,795											211.7
	1987			211.736											l ""
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1988												,		359,6
	1969			359,677								•			205,
	1990	3	-	205,128											462,1
2.1	199	1		297,116	165,713							:			4 € 2,1
3.	199.	1													207.
	1921	1		287,241										- 1	489
4 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	1994	1	90,006	339,035											
	199	I .		25,492							<u></u>				25

Rainfail : Lacogora	Table FT Dota:	IV.4 (1/2 Salavan) IKK	GGAT[(UN WA	IFK KE	QUIRE	TRSEA	(LOWE)	K AE SI	STSCH	E51E)	
	130.	Feb	Mar.	Ad	May	June	July	Avg.	Sept	Oct	Nov.	Dx	1
CROPPING PATTERN - A	77792		mare a contra	1		WILL	-	l	1		<u> </u>	·41/	
	1410	Tring	addy	aran aran aran aran aran aran aran aran	necessia.	100	~~,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	A Property of		RECEIVED AND	PROGRAMMENT		1
	Dry	Season E	300y				Rais	y Season I	Paddy T		Dry	Season P	addy I
			i			·	·		·				İ
CROPPING PATTERN - B1		100	918			(4/1)	Try grown	1908-1822 B 1806. 1809-1823 B 1806-1823 B	NORCHON BOOK THINKS	and the second		A. C.	
	T V	pland Cn	eren eren. Dos	50 530 597 			S. Saig	y Season	Parkly		U	oland Cro	i los
Monthly Rainfall	9				140.4	227.9	3581	225 1	217.3	158.5		0	<u> </u>
<u>Potential Evapo-transpiration (Salaya:</u> Effective Rainfall (Paddy)	145.0				199.0	183.8	147.0 238.5	128 0 182 3	110.0	158 0	162 0 10 2	151 O	193
Effective Rainfull (Upland Crope)	0.0					1321	140.0		129.9	111.6	- 19		·
CROFPING PATTERN - A						<u>, </u>	 -						r
Dry Serson Paddy	1	{		} - -		l	-						
Orop Coefficient (Kr.)	1 00			113	1 10							0.00	
Orup Evaputranspiration (ETerop) Percolation	93.0				218.9 93.0	141.0 90.0						0.0	ļ
Sective Rainfull	0.0				1193	183 8						0.0	
Area Factor	0.25			0.75	0.3	0.0						0.0	
Puddring Water Nursery Water	90.0 11.0		i						lI			100	l
Net Irrigation Requirement	161		335	224	0	0	·					55	1
Rainy Season Paddy	<u> </u>		ł						~ ———				
Crop Coefficient (Ke)	1	 			·	0.90	0.93	1 07	1.13	1.15	1.08	1 00	
(Prop Evapo-transpiration (ETreop)		[I		1269	139.7	136.5	161.0	181.7	174.2	851.0	1.0
Percolation Effective Rainfall	 	·	·	·	1193	183.8	64 238 6	182.3	177.9	134.7	10.2	0.0	
Area Factor	1	t-:				0.06	0.5	0 94	11.73	0.94	0.5	0.06	<u> </u>
Fuddring Water		ļ ——				79	79	11					
Narsery Water Net Irrigation Requirement	† 	 	 		!! 0	10	G	<u>-</u>	43	96	107	13	l
	1												
brigation Efficiency Conveyance Efficiency 85 %	0.6	09	0.6	0.6	06	0.5	0.6	0,6	0.6	0.6	0.6	06	l
Application Efficiency 70 % of paddy	field	ļ.——.—			l	-			<u> </u>				l
Gross brigation Requirement	268			313	0	0	0	29	72	160	178	213	2.
(lin/sec/ha	1 100	1.70	2.08	1.41	4.00	0.00	0.00		0 28	0 60	0 69	0.42	L
CROPPING PATTERN - B.1	1												
Upland Crops Grop Coefficient (Ke)	0.85	0.95	0.90	0.40									ļ
Grop Evapo-transpiration (Efferop)	123.3	172.0		83 2	·						0.70 113.4	0.73 109.5	
Effective Rainfall	0.0			18.0							42	0.0	
Area Factor Net Irrigation Requirement	0.90			0.50 33	C 06					<u></u>	0.05	0.40	
	1	1	1									4,	
Rainy Season Paddy Grop Coefficient (Kr)		<u></u>	ļi. ļ										
Crop Evapo-transpiration (ETcrup)						126.9	0.95 139.7	1.07 136.5	1 15 161 0	181.7	1.08 174.2	1.00	
Percolation						50	64	64	60	64	60	64	4
Effective Rainfall Area Factor		<u>-</u>		~ -i	119.3	183.8 0.06	238.6	182 3 0.94	177.9	134.7 0.94	10.2	6.0	1.0
Puddring Water	1				11	79	0.5 79	U.94		0.74	0,5	0.06	1
Nursery Water					11.	10	0	0					
Net Irrigation Requirement					0	0	0	17	43	96	107		2
Irrigation Efficiency	0.51	0.51	0.51	0.51	0.51/0.6	0.6	0.6	0.6	0.6	0.6	0.6/0.51	86/058	
Convey ance Efficiency 55 % Application Efficiency 70 % of public	6-14-60-5	of notond o				- -					·		<u> </u>
Gross Irrigation Requirement	218			64	· · · · · · · · · · · · · · · · · · ·		0	29	72	160	189	92	1,4
Git south	0.81	1.32		0.25	0.00	0.00	0 00	0(1	0 28	0 60	0 73		
Rainfall (Lacogran)	Γ											1	
1986				1172	346.7	252.4	429 3	5625	243.9	186 2	237	12.9	2,23
1987 1988		0.0 77.9		187.4 228.0	183.B 271.4	370.6 243.3	419.0 287.0	600.0 372.3	210.4 223.3	158.4 235.9	0.0	0.0 0.0	
1989	18.8	0.0		183.6	410.3	193.1	402 7	2735	186.L	233.9 128.7	. 44	0.0	
1990				71.7	238.4	305.0	292 0	367.4	233 2	218.6	22 6	0.0	1,87
1991 1993		0.3 5.6		26 3 56.7	207.8 2(4.3	259.8 434.8	414.9 330.7	560.9 552.8	301 5 332 5	266 2 97.3	0.1	5.S 0	
1993	0	2.5	37.4	412	261.1	26.3	249 2	377.7	392 9	47.7	65	0]	1,46
1999 1995		• • • • • • • • • • • • • • • • • • • •		136.4	218.3	285.7	461	249.2	309.2	1101	1.2	o o	
Monthly Unit brigation Requirement l			7.6	24.3	140.4	227.9	3581	225.1	217.3	158.5	12	0	1,38
ROPFING PATTERN - A ROPFING PATTERN - B.2	1.00	1.70		1.44	0.00	0.00	9.00	011	0 28	0.60	0.69	0.42	8
1996 CROPPING PATTERN - A	268	429	132 514	0.25	0.00	0.00	0.00	0.12	0 28 78	0.60 161	0.73 195	034 113	<u>5</u>
CROPPING PAITHEN - B 1	218	330	276	0	0	0	0	0	48	120	172	82	1.3
1981 CROPPING PATTERN - A CROPPING PATTERN - B 1		337	514 310	111	0	0	0	0	78 78	161	195	113	18
1988 CROPPING PATTERN - A	242	318	533	101	0	0	0	0	66	161	206 183	92	<u>l.</u> 4
CROPPING PATTERN - B 1 1989 CROPPING PATTERN - A	194	224	329	0	0	0	0	0	66	71	193	92	
			48± 279	145	0	o	<u>0</u>	0	104	203	194 205	113 9:	<u>1.9</u>
CROPPING PATTERN - B 2		428	390	366	0	0	0	0	51	87	163	163	1.0
CROPPING PATTERN - B 2 1990 CROPPING PATTERN - A	267		191	30	3	0	0	. 0	57	87)73	9.	1,1
CROPPING PATTERN - B 1 1990 CROPPING PATTERN - A CROPPING PATTERN - B 2	217	335											
CROPPING PATTERN - B 2 1990 CROPPING PATTERN - A CROPPING PATTERN - B 1991 CROPPING PATTERN - B 2 CROPPING PATTERN - B 2			560	370	0	0	0	o	<u>\$</u>	46	206	96 81	
CROPPING PATTERN - B 1 1990 CROPPING PATTERN - B 2 CROPPING PATTERN - B 2 1991 CROPPING PATTERN - B 3 CROPPING PATTERN - B 3 1991 CROPPING PATTERN - B	267 267 217 190	428 337 421	560 355 569	370 62 327	0	0 0		0		46 247	206 195	96 84 113	1.3
CROPPING PATTERN - B 2 1990 CROPPING PATTERN - A CROPPING PATTERN - B 2 1991 CROPPING PATTERN - B 2 1992 CROPPING PATTERN - B 2 CROPPING PATTERN - B 2	267 267 217 190 146	428 337 421 329	560 355 569 363	370 62 327 40	0	0 0 0	0 0 0	0 0	5 0 0	46 247 247	206 195 206	84 113 92	1.3 2.0 1.4
CROPPING PATTERN - B.2 1990 CROPPING PATTERN - A. CROPPING PATTERN - B.2 1991 CROPPING PATTERN - B.2 1991 CROPPING PATTERN - B.2 1992 CROPPING PATTERN - B.2 1993 CROPPING PATTERN - B.2 1993 CROPPING PATTERN - B.2 CROPPING PATTERN - B.2	217 267 217 190 145	428 337 421	560 355 569	370 62 327	0	0 0 0 130	0	0 0 0	5 0 0	46 347 247 317	206 195 206 186	84 113 92 113	1.2 2.0 1.4 2.2
CROPPING PATTERN - B: 1990 CROPPING PATTERN - A: CROPPING PATTERN - A: 1991 CROPPING PATTERN - A: CROPPING PATTERN - B: 1991 CROPPING PATTERN - B: CROPPING PATTERN - B: 1993 CROPPING PATTERN - B: 1994 CROPPING PATTERN - B: 1994 CROPPING PATTERN - B:	267 267 213 190 145 268 218 268	428 337 421 329 425 334 426	560 355 569 363 516 312 475	370 62 327 40 345 50 214	0 0 0 0	0 0 0 130 130 0	0 0 0 0 0	0 0 0 0	0 0 0 0	46 247 247 317 317 229	206 193 206 186 197 189	84 113 92 113 92 113	1.3 2.0 1.4 2.2 1.6
CROPPING PATTERN - B. 1990 CROPPING PATTERN - A. CROPPING PATTERN - B. 1991 CROPPING PATTERN - B. 1991 CROPPING PATTERN - B. CROPPING PATTERN - B. 1991 CROPPING PATTERN - A. CROPPING PATTERN - B. CROPPING PATTERN - B.	217 267 217 190 146 268 218 268 218	428 337 421 329 425 334	560 355 569 363 516 312	370 62 327 40 345 50	0 0 0	0 0 0 130 130	0 0 0 0	0 0 0 0	0 0 0	46 247 247 317	206 195 206 186 197	84 113 92 113 99	19 13 20 14 22 16 19 13

			R R 30	SATION	WATE	8 EXQ1 1 E	EMENT (LC) W f R	KE SET:	SCBEN	4E)	
riche Creyne	El Fett Sale											
* a * 2 * *	Mail Crop U:	D 2 2 3.				<u> </u>			6a	×× T	Dec	
		14 1	(ar	AN	- <u></u> T-	kw M	Aya	Sept	<u> </u>		- Dec	_T.#
gair Para - Les ar Can Can		电弧性线					-— 			8 62		
126 Charles W	2.4	175 .	1.76	4 93				+ (\$	1.0	0 54	***	
CIRNO 31	846	1.50	L 03						4.6		• 314	
CPE-T-C	9.5	194	+ 29	5 53 5	. # 11.				113	6 23	011	
Clea O	8.0	1.52	ιw					1		494	5.7	
Colline	873	1.85	+ 34	. 4.4[- 02					473	27	
14: CPcm A	1.00	(33	6 92	4.54				0.30	0.00	÷ 75	642	
Clear Di	4 N	1.39	114					0.30	6 60	4 SQ	9.34	
Chan C	8.37	1 20	C# 1	♦ 刀	916			0.00	● 19	4 26	0.12	
China Ct		1.39	14							* 24	9.5	
Coffee	1.7		14	● : €	014				0.01	+14	0 %	
120 CPeters A	6.00	132	1 17	+ 70				4.%	6 27	6 70	8 43	
Charte 92	0.72	1 13	123					4.56	617	+ 15	* 34	
CPsters C	6.12	4 59	125	+35	6.11				0 07	+25	0.12	
Chan C	8.72	4 23	13							0.04	0.3%	
Coffse	8.64	161	8 74	+11	 ₩					4 94	9.76	
1000 C Paterta - A	0.90	L.73	1 80	0.56				44	0 %	• 75	840	
CPeters 82	0.72	4 39	184					110	* 76	* "	. 0.34	
CPC-12 C	. 10.0°	1.09	0 %	9.0	8 12			46	**	4:4	012	
Cheen (7	4.77	1.39	104							004	6.3.	
Coffee	691	3 01	0.51	+ 19	8 02				912	654	0 N-	
1940 C POLICE A	130	177	1.46	118				9.22	0.52	. 663	6 92	
Creen 91	6 \$1	1.39	971	• (1				22	0.30	667	8.34	
Creen C	637	1.08	0.16	♦ 27	0.13				8 09	6.3	0.12	
Classica CI	9.14	130	# 7L	e ct						0.04	6.32	
Coffee	9.73	1.00	#3L	463	0 %					9.75		
1934 CFallette A	1 00	1.77	2.09	14				0.02	9 17	0.75	0.36	
(Perc II)	l in	1.39	13)	1.34				0.02	8 17	4 60	631	
Chicago C	l in	180	121	49	015				0.05	926	012	•
Chiles Ca	1 10	139	137	124	*					0.04	#31	1
Coffee	+73	i de	107	684	# 10					014	6.73	
190 Cham A	67	1.34	213	1 36					0.42	♦75	4 12	
CPten 12	1 33	136	1.36	16					6 12	8.60	9.34	•
CPatient C	1 12	997	124	844	Ø 15				46	926	0 t2	1
Crem Ct	1: 69	LK	136	0 16	•				• • •	P.04	0.32	
Collec	1 10	. +7	110	70	0.39				4.8	984	0.76	
1995 CfaCoro A	- 1 1 00	1 16	1 93	10		0.30			()1	9 72	0.42	
CFacos B2		134	117	1/5		8.50			1.78	a 16	0.24	
CPices C	1 12	899	1 04	6 90	432	0.17			0.61	0.25	8) 2	
CPasson C2	1 3	1.5%	10	619	4 7-2	0.05				004	0.32	
Coffee	1 15	P 29	6 93	0.76	0.34	9.53			449	081	0.76	
100 CFabre A	100	17	1.77	- 00	· · · · ·		\$e)		115	0 73	6 52	h
CPites 33	1 4	1.3	1.02				00)		6 85	9.77	134	ŀ
CPston C			6 82	0.65	674		24)		#35	9 25	9 13	1
Crism Ci	9.37	1.29	1 02	4.0	4.74				7.0	0.04	0.32	
Coffee	4.73	5.56 5.00	9.79	4.8	0.06				÷ 35	942	4.75	1
1995 CPatters A	100	- 5 CQ	2 05		- V:-		411	0.76	660	0 69	9 42	
CPacer 11	100	1.52	132	15			# 11 # 11	1.36	660	0.73	934	1
CPiGra C	1 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	994	1 20	100	0.24		• 11		419	9.24	412	1
Chica Ch	• • • • • • • • • • • • • • • • • • • •	8.52	1 32	0 25	0.24				411	0.04	4.32	
Canada Ca	1 44	- 3		40								

96. 97. 97. 98.6 98.6			8	ĸ	h		n	h		<u>31</u>	20	31	
*; %;			31		jı		л	<u>n</u> _				31	
* i		x		K			h						
* i				<u> </u>									

302													l
													١.
92.7													1
	Jan.												,
		1,57	1.4%					167	61.1			- 4.65	MCM
9×	6819	E 69	1 172	165				9 00 E		4 154	0.764	9 3 50	
						6.501				LIES	0.751	4.367	14.3
									6 917				
9) 1	0.547	£ 46.3	8 863	4.527									
		E 464	1 194	# 112					6 401	4 756	6.74.7	0.3%	151
	414	F 403	1579	0 136									
7													MON
	-	74-1	Met T	Acr. T	Vo I	-a∵ T	14,	A:at	Sept	3a T	7-T	Dec	144
	を を は は な の の の の の の の の の の の の の	報** 0 849 第75 第75 第75 第75 第87 第87 第87 第87 第87 第87 第87 第87	No. Fd.	No. Feb. No.	No. Feb. No. Apr.	No. Pab. Mor. Aqu. Mor.	No. Pob. Mor. A.q. Moy. No.	No. Feb. No. Apr. May No. No. No.	No. Feb. No. Apr. May Book Day Apr.	No Feb. Mrd Aqu Mrg Bad Peb Aqu Seq.	No. Feb. Mor. Apr. Mor. Eve. Mor. Apr. Out.	No. Par. May No. Par. Mar. Mar. May. May. May. May. Sept. Col. Max. Dec.	

Coffee														
122		1,4	700											
				0.3-0-0					Rin	9 1			ţa.	
		Au I	Feb	Na Ma	4-1	X	Av I	Futy	A.g	Sept	Cet.	N	Dec	Total .
righting Bruss for all		40.00												
	(985		6 567	8 624	0.726					P 129	8.45	4446	B 100	[≱∎
	197		0.620	4671	6 192					1262	9 120	6527	\$ 1 ab	
	175		9 461	6 6 X	0136					D 4.79	i 116	*****	9 (48	
	1483		067	9.624	9.195					6.750	0.536	6.524	1 10	
	1950		961	4510	0.413					9 (54		0.410	0144	
	1991	134	0.20	273	0.439					0.042	 0 (2) 	4 521	\$ 125	
	170		4 4 7	0.454	# C\$4					0 012	0.1,21	0.337	9 110	
	(39.5	43%	4 349	9,404	4346	1453					8 4372	* 182	● (34)	
	1954		441	0.454	0.364							430	8.10%	
	1995		121	25.3	135_							4.31	- 23%	_12
e o d		Cal allow					-	*						
	178	430	199	2.359	140	(3.53	26 20 1	44	(240)	0.30	26.47	17.54	7 621	
	1987		3 156	123	3 227	20.117	14 954	26 4.50	43 465	47 (17	26 4:4	ONT	6 744	
	1744	463	4 25	1263	4 120	12.00	21 6:6	1934	34.2	27,857	25115	14 233	\$ 747	
	131		181	2.367	3 450	36 349	25 500	24 947	E 51.0		21 749	()30	3.907	
	1970		264	3 4 7 7	24	E 15#	Ø BI	21.775	21 903	39.434	31 154	16314	6 11A	
	1771		3174	10.4	314	6.99	17 267	32 430	41 67	40.761	31.44	17500	9 70(!
	1992		1 349	233	1.09	414	11.11	28 654	43.331	2017	20.10	\$\$ IC\$	\$ 94.1	
	1993		. 200	2.422	1 400	5 509	3,975	14.307	27.59	D. 743	15.7%	7.440	4.364	
	1994		1340	1949	1.36)	16 Si t	14.672	24.61	30 921	32 (5)	14.114	9015	\$ 223	ł .
	199	_سدد1	2,839	124	1171	_ 3.34	3.10	_12_52_	_ 25.50	29,797	14.710		125	
مو دادا		I												
	190	3 742	1474	1 735	2 636	13 62	20 76 7	31 1.4	42 471	40 (16	20 0-12	47135	1,520	
	1987		2 1)5	1 763	104	10.117	19.364	M +50	45 495	40年67	2014	1) 170	€ 129	
	170.5		1594	1.566	4.584	12.64	23 415	14">7:	34 22 T	27.5%	24.94	13.743	\$ 5 24	
	1912		1 34	144	3 753	16 349	25 4.0	24 347	25 92 9	JC (43	22 4/9	12 763	9 730	
	1990	3 307	1.30	1667	1328	# ISF	15 253	21 723	27,403		30 307	15 874	\$ 17	
	134		139	1365	15-6	6.598	11 217	32 A36	41 173	4) 106	37.(%	17,812	144	
	1952		1 560	835	4 194	414	나보선	26 624	10.6	D 117	20.24	9.549		
	1966		140	104	. 1 053	3 34 5	5.375	14,307	27.592	D NJ	. 13 24	724	434	
	17-4	15%	1 53	6 454	. 457	18.515	[4] 2	26 6.53	AC 661	32.0%	19.50	4.43	\$ 117	
	. 17/3	1.05	1.47	203			3.50	12.31	. X 191	2.77	12.719	4.7%	-4.2%	

Rainfall : Sekong	ET Dota : :						<u> </u>		-	UN SCI			
	Jan.	Feb.	M.s.	À.T.	May	Узпе	July	Aug	Sepi	Q4	Nov.	Dec	4
ROPPING PATTERN - A	1777	i Marita	* h* n * 100+2	are care as		Ulm	egemenne.	i	i	a nomen and a second	<u>. </u>	4111	
	11111	///	COLUMN STREET	and speciments.	nes mariana		UTITE.	Mark Particular	Paddy	CLASS SUR	and the		
	Dry	Season P	ಚರೆಳy 				Rain	y Scasoo I	Paddy	ļ	Dŋ	Season P	askly I
	 -	 				 		 -	}	 	}	!	ł
CROPPING PATTERN - BJ	0.00					UUII	*****	Parana	*******	*******			
!		pland Cro			·		4077	75	Michigan Parketo Res	AND RES	********		
		pana cro				l	Kun	y Season I	raouy		} <u>`</u>	Ipland Cre	gs I
						i							
Monthly Rainfall (Salavan 1988)	0		0	886	340.3		383.7	160 6		110.3			
Potential Evapo-transpiration (Salavaa) Effective Rainfall (Paddy)	145.0		219 D	208 Q 75 3	199 0 231 7		147.0 246.3	128 0 136.5	140 0 121.0	158.0 93.8	162.0 8.2		
Moctive Rainfall (Upland Crope)	0.0		0.0	65.6	1400		140.0	1125	104.3	81.6	72		
ROPPENG PATTERN A		,				r							
Dry Season Paddy		ļ										 	
Prop Coefficient (Kc)	1.00	1 10	L 13	1 13	\$ 10	1.00						900	
top Exapeti inspiration (ETcrop)	145.0		248.2	235.7	218.9						1	0.0	
ecolation flective Rainfall	93.0	81.0	93 0 0.0	90.0 75.3	93.0 232.7	90 0			·	·	ļ	17.1	
Vea Facks	6 25	0.75	1.00	0.75	0.3					• • • • • • • • • • • • • • • • • • • •		0.0	
udring Water	90.0	450	i			[l	45.0	
iursery Water et trogation Requirement	31.0 161	257	341	169		} <u>-</u>					ļ	10.0	
	101	<i></i>	331	169		<u>"</u>						<u>3</u> 8	· · · · · · · · · · · · · · · · · · ·
Rainy Season Poddy												1	
rop Conflicted (Ke)		ļ				0.90	0.95	1.07	£ 15	1.15			
hop Evapo-banspiration (ETcrop) broofstien		·	i	·		126.9	139.7 64	136.5 64	361 0 60	1817	174.2	151 0 64	
Nective Rainfall					233.7	187.7	246.5	136.5	1210	93.8	8.2	17.1	-
Sea Factor						0.06	0.5	0.54		0.94			
uddring Water ursery Water		i	ļ		()	79 10	79	11	 -	<u> </u>	 	}	
et Erigatina Requirement								63	100	137	100		
- 													
rigation Efficiency long ance Efficiency BS &	0.6	0.6	0.6	0.6	0.6	<u></u> 06	0.6	0.6	0.6	- 05	0.5	06	
Confession Efficiency 70 % of partly fi	ld					<u> </u>						1	
ross Irrigation Regulterment	268	428	569	202	0	0	0	105	167	229		6)	
([it/scc/ha)	1.00	1.77	2.12	1 09	6 00	0.00	0.00	0.39	0 64	0.65	0.70	0 24	L
ROPPING PATTERN - B.1			[: :	r in					Γ	1	
'pland Creps												1	
rop Coefficient (Ke)	0.65	0.95	0.90	0.40						ļ	8.70		
hop Evapo-transpiration (EFcrop) Ifective Rainfall	923.3 0.0	172.0	197 1	83 2 65 6					<u>-</u> -		113.4 3.4	109.5	
Lea Factor	0.90	1.00	0.94	0.50	0.06						0.05	0.40	
et in gation Requirement	111	172	385	9	0	iI					5	4)	ļ
Rainy Season Paddy	~										ł	 	
rop Coefficient (Ke)						0.90	0.95	1.07	1.15	1 15	1 08	1.00	
nop Evapo-transpiration (ETcrop)						126.9	139.7	136.5	161.0	181.7	1742		
ercelation Nective Rajafall					232 7	187.7	- 64 245.5	136.5	60	64 93.8	60 8.2		
trea Factor					424.6	\$ 06	0.5	0.94	1210	0.94		0.00	
hydring Witter					11	79	79	11					
imsery Water et Imagation Requirement					1	10	0	0			109		
See Barera McGrid Chiefa					0	-		<u>6</u> 3		131		°	
rigation Efficiency	0.51	051	0.52	0.51	0 51/0.6	0.6	0.6	0.6	0.6	0.6	0.6/0.51	0.5/0.51	
Conveyance Efficiency BS &	de 60 a										·		
Coplication Efficiency 70 % of paddy for Bross Infortion Requirement	218	336	363	27	0	0	0	105)67	229	192	80	:
(tit/sec-ha)	0.81	1 39	1.36	0.07	0.00		0.00	0.3>		0.65			
hinfall (Schong)													
1986	6.0	127	70.3	128 2	378.8	2729	467.4	610.7	266.8	202.3	26 0	14.2	2.
1987	0.0	0.0	42.7	264.9	198.5		455.6	642 6	730.5	173.8	0.0	0.0	2,
1988 1989	19.9 8.4	85. E 0.0	27.8 70.2	249 3 269 9	295.9 267.4		313.5 490.2	406.5 373.3	744.3 337.9	257 9 171.0			2,
1920	0.0	60	76.7	98.0	257.5	372.0	2902	552.2	354.2	196.6			2
1991	7.4	136 2	359.9	54	167	149.5	288.1	330.9	133.3	263 6	298	112.8	2,3
1992 1993	44.6 17.5	45.9 37	133.4 113.3	132 162 7	130.7 214.7	133 6 307	173.9 188.7	260.7 300 1	280 1 412 9	126			1.
1994	17.3	97	70.1	93.2	169.5		317	312 S	411.9 243	21 J. J 80 2			2,4 1,1
1995	0	05	. 0	836	340.3		383.7	160.6	142.3	1103			1.
loobly Unit frigation Requirement by ROPPING PATTERN - A	Year (Rain) 1 00	(all) : lit./sec	/ha 2 2		امام	,						1	
ROPPING PATTERN B.2	0 81	1.77	1.36	1 09 0.07	0.00	0 00	0.00	0 39 0 39	0.64	0.85	0.74	0.34	
1986 CROPPING PATTERN - A	268	41)	469	226	O.	0	. 0	0	29	103	158	73	
CROPPING PATTERN - B 2 1987 CROPPING PATTERN - A	218	319	267	0	0	0	0	0	29	103	169	8.2	
CROPPING PATIERN - B 2	268 218	429 331	508 305	123	0	0	0	<u>-</u> 0	60	139	195 206	92	
1988 CROPPING PATTERN - A	239	306	529	62	Đ	0	0	0	48	53	181	113	
CROMPING PATTERN - B ?	191	214	325	0	0		. 0	0	48	\$3	192	92	
1989 CROPPING PATTERN - A CROPPING PATTERN - B 2	256 207	$-\frac{429}{337}$	469 268	- 66	D		0	0	<u>-</u>	343	J28	11	
1990 CROPPING PATTLESS - A	268	429	460	26.8	0		0	0	0	109	130 159	91	
CROSPING PATTERN - B 2	218	337	259	16	0	0	Ö	G	0	100	169	9.	
1991 CROPSING PATTERN - A CROPPING PATTERN - B 2	257	236	170	331	0		0	0	179	48	9	0	
1992 CROPIENG PATTERN - A	208	139 364	105 360	42 220	0		0 .55	0	179	48	0	. <u>5</u> 5	
CROPPING PÄTTÉRN - B 2	159	271	181	7.50	0		33	0	19	206 206	6	O	
1993 CROPPING PATTERN - A	243	376	408	137	0	0	34]	. 0	0	94	٥	0	
CROTPENG PATTERN - B 2 1904 CROPPENG PATTERN - A	195	283	209	D	0		34	0	. 0	94	1	36	
CROPPING PATTERN - B 2	2(8	337	469 268	275				: 0	49	<u>271</u>	193 204	100 85	
1995 CROPPING PATITIEN - A	20.8	428	569]	4441	G.		0	170	367	(2Y	183	D.51	7
1995 CROPTING PATTERN - A CROPILNO PATTERN - B 2	218	3%	363	<u>282</u>	0		0	160	167		191 192	53 80	

Table IV.5 (22) IRRIGATION WATER REQUIREMENT (UPPER TAY-UN SCHEME)

Rainfall : Schong Ef Data : Salavan

	with Streage	s (total effec	tive capacity	\$00,000 cu	a)								
	Jan.	Feb.	Mar	Age.	May	June	July /	Aug.	Sept	Od.	Nov.	Dec	Total
Basic Data : Irrigation U	nit Water Requ	reason (lit./	sec ha)										
1986 C.Pattere - A	1.00	1.70	1.75	0.87					0.11	0.39	0.61	0.27	6.70
C.Pattern - B.2	0.81	1.32	1.00						0.11	0.39	0.65	0.31	4.58
C.Patters - C	037	0.93	0.86	0.49	0.11					0.11	0.22	0.11	3.21
Coffee	0.59	0.75	0.57	0.26							0.56	0.55	3.28
1987 C.Pattera - A	100	1.77	1.90	0.47					0.23	0.52	0.75	0.42	7.07
C.Pattern - B.2	0.81	1.39	1.14						0.23	0.52	0.80	0.34	5.23
C.Pattero - C	0.37	1.00	1.05	0.28	0.15					0.16	0.26	0.12	3.37
Coffee	0.59	0.82	0.70	0.05	0.03						0.68	0.62	3.48
1988 C.Pancia - A	0.89	127	1.58	0.32					0.18	0.20	0.70	0.42	5.96
C.Pattern - B 2	0.71	0.88	1.21						0.18	0.20	0.74	0.34	4.28
C.Pattera - C	0.32	0.56	1.09	0.22	0.11					0.05	0.25	0.13	2.72
Coffee	0.50	0.38	0.76								0.64	0.62	2.90
1989 C Pattern - A	0.95		1.75	0.25						0.53	0.49	0.41	6.17
C.Pattern - B.2			1.00							0.53	0.53	0.34	4.57
C.Pattern - C	0.35		0.86	0.21	0.11					0.16	0.19	0.13	3.01
Coffee	0.55		0.57								0.46	0.61	3.01
1990 C Pattera - A	1.00		172	1.04					~	0.41	0.61	0.42	6.97
C.Pattern - B.2	1		0.97	0.04						0.41	0.65	0.34	4.62
C.Pattern - C	0.37		Q.B3	0.64	0.12					0.12	0.22	0.12	3,42
Coffee	0.59		0.54	0.41						:	0.56	9.62	3.53
1991 C.Pattern - A	0.96		0.63	1.28					0.69	0.18			4.72
C.Pattern - B.2			0.39	0.16					0.69	0.18	0.00	0.20	2.99
C.Pattera - C	0.78 0.35		0.22	0.15	0.20				0.22	0.05		0.02	2.2
	0.56		0.22	0.62	0.09				V.24	0.00		0.09	1.49
Coffee			1.42	0.85	0.03		921		0.08	0.77			5.58
1992 C.Pattern - A	0.76		0.68	Ų.63			0.21		0.08	0.77	0.02	0.23	3.69
C.Pattern - B.2	1		0.52	0.48	0.24	0.02	0.02		0.00	0.29	0.06	0.04	2.68
C.Pattern - C	0.25		0.27	0.24	0.17	0.02	0.02			0.06	001	0.19	
Coffee	0 38			0.68	V.17		0.13		 -	0.35			5.1
1993 C.Patters - A	0.91		1.52	0.68			0.13			0.35	0.00	0.13	3.29
C.Pattern - B.2			0.78	0.37	0.15		0.13			0.10	0.00	0.12	2.3
C.Pattern · C	0.32		0.63	0.37	0.00					0.10			1.6
Coffee	0.51		0.37	0.14	0.00				0.19	1.01	0.74	0.37	1.90
1994 C.Pattern - A	1.00		1.75	1.06					0.19	1.01	0.79	0.32	
C.Pattern - B.2			1.00	0.05	0.19				0.19	0.48	0.26	0.32	
C.Pattere - C	0.37		0.86	0.66						0.40	0.67	0.59	
Coffee	0.59		0.57	0.43	0.08	 -		0.70		0.85	0.70	0.33	
1995 C.Pattera - A	1.00		2 12	1.09				0.39 0.39	0.64 0.64	0.85	0.74	0.30	
C.Pattern - 8.1	7.77		1.36	0.07						0.85	0.25	0.10	
C.Pattero · C	0.31		1.24	0.69	0.11			0.00	0.18	0.55	0.64	0.10	
Coffee	0.59	18.0	0.89	0.45						V.13	0.01	9.34	1

WATER DEFICIT FOR IRRIGATION OF PLANNED CROPPING AREA

Cropping Area	Dry S. Ra	iny S.
Paddy	70	330
Upland Crops	80	Ì
C.Pattern - C		
Coffee		-
Total	150	330

	1		D	ry Season	· · · · ·		1		R	niny S				Dry	<u> </u>	
		Jan.	Fcb.	Mar.	Apr.	May	June	July	Aug	<u>.</u>	Scot	Oct.	Nov.	Dec	Total	ļ ·
reigation Requirm	cal	m3/sec.											1.4		(MCM)	2
re Burano seedeman	1986		0.224	0.202	0.061						0.037	0.127		0.044		' '
	1987		0.236	0.224	0.033						0.076	0.171	0.248	0.057		ŀ
	1988		0.160	0.236	0.022						0.061	0.065	0.231	0.057		1
	1989		0.236	0.203	0.018							0.176	0.163	0.656		!
	1990		0.236	0.197	0.076							0.134	0.203	0.057		: '
	1991		0.114	0.076	0.102						0.229	0.060		0.016		
	1992		0.195	0.153	0.059			0.06	8	,	0.025	0.254	4.5	0.018		
	1993		0.203	0.169	0.048			0.04	2			0.116		0.011		
	1994		0.236	0.203	0.079						0.062	0.334	0.245	0.051		
	1995	0.135	0.235	0 257	0.081				0.	129	0.212	0 2%2	0.231	0.041		l
Deficit		m3/sec.													(MCM)	
Atka	1985															
	1987															l
	1988														i -	i
	1989			0.020										:	ì	1
	1990		0.022	0.022												ł
	1991		V.011													
	1992														13	
	1993															1
	1994		0.022	0.049	1 1										0.18	
	1995		0.085	0.169	0.035										0.75	ĺ
															I	Į .
Days of month		31	28	31	30	31	3	0 3	<u>. </u>	31	30	31	30	31		<u> </u>
Xeficit		cu m													Dry S.	Rainy:
	1986	1													l	ĺ
	1987															
	1988														1	
•	1989			52,911											52,911	
	1990		51,019	59,879											113,928	1
	1991			•												
	1992															1
	1993		•													ı
	1994		53,220	130,149											183,369	
	1995		205,172		90,716										749,397	1

Table IV. 6 Water Balance Calculation (Upper Champi Scheme)

5	Champi Scheme	:			* *										
R	Runoff	5	13/sec)	٠											
		ň	Jan. Feb.							× ×	ر کر	No.	٠. م	Total	7
•			31:	83		۶,	₩,	ಜ	3	3	S	31	\$	۳.	i
Runoff-1		1986	0.41	0.32	0.25	0.24	0.60	96.0	4	. %:	2.06	. 94	8.0	3	
		1987	0.41	0.32	ม	150	0.48	68.0	1.63	507	2.02	1.46	0.81	4	
		1988	0.38	0.32	0.27	0.37	9.6	70:	0.92	1.65	1.35	1.24	67.0	0.42	
		1989	0.32	0,24	0.18	0.21	0.72	1.16	1.14	8;	1.41	1.13	0.69	0.39	
		1990	0.29	0.21	0.18	0.15	0.37	20.0	0.97	124	1.70	1.47	0.86		
		<u>\$</u>	0.13	57.0	0.0	0.31	0.28	0.50	0.75	1,33	9	2	86.0	0.70	
		1992	0.39	0.31	0.26	0.23	0,31	0.49	0.81	1.19	7	1.15	0.69	3	
		1993	0.0	0.23	0.18	0.76	0.27	0.52	99.0	0.82	1.29	1.14	83	9	
		1994	67.0	0 17	0.15	0.14	0.23	0.56	86:0	1.31	34.	1.12	0.51	0.31	
		1995	0.22	0.15	0.09	0.05	0.26	0.42	0.81	0.83	0.87	0.65	0.31	0.17	
Trigation		1986	0.05	.00	ý	. 00	8	. 8	8	. 8	8	8	ç		
Demand-1		1987	\$00	010	0.00	8	380	3 8	3 8	3 8	3 8	3 8	70.0	200	
(m3/sec.)		1988	0.03	0.02	0.08	8	000	8 8	8 8	3 8	3 8	3 8	500	70.0	
		6861	00	010	0.05	000	000	900	880	88	8 8	3 8	3 6	7 6	
		0661	0.05	0.0	8	003	8	8	6	8 6	3 8	3 8	3 5	7 6	
		166	8	0.10	800	000	8	800	8	88	3 8	3 5	3 8	70.0	
		1992	0.03	8	800	86	8 8	8 8	3 8	3 8	3 8	5 6	5 6	70.0	
		1993	500	0.0	800	200	8 6	88	3 8	3 8	3 8	70.0	5 6	500	
		1995	0.0	0.07	8	000	8	8 8	8 6	8 8	3 8	8 8	3 8	700	
		1004	800	90		200	8		3 6	3 3	3 6	3	70.0	3	
		766	Ĉ.	ŝ	70.0	0.0	800	20:00	90:0	800	0.00	000	0.02	0.01	
Runoff-2		1986	9.70	0.23	0.21	0.23	9:0	960	. 45.1	967	2.06	1.46	96.0	0.52	
		1987	0.36	0.22	0.18	0.31	8*(0	68.0	1.63	2.01	2.02	4.	0.79	4	
		8861	0.74	0.70	0.19	0.37	0.60	1.07	. 260	39:1	33	4.	92.0	9	
		1989	0.28	7 0	0.13	0.21	0.72	1.16	1.14	1.60	1.41	1.13	0.67	0.37	
		86	0.25	0.11	0.13	0.12	0.37	20.0	26.0	124	1.70	1.47	0.84	0.39	
		185	0.29	0.15	0.24	0.31	0.28	0.50	0.75	1.33	()	1.28	56.0	99.0	
		185	9.30	0.22	0.18	0.19	0.31	0.49	0.81	1.19	<u>.</u> .	1.13	0.67	0.40	
		86	0.25	0.13	0.10	C. I.O.	0.27	25.0	99.0	0.82	1.29	:08 :18	0.80	0.59	
		\$66	0.25	0.15	0.13	0.14	0.23	0.56	86.0	Ē	1,46	1.12	0.49	0.31	
		\$65 2	0.18	0.07	0.07	0.03	0.26	0.42	0.81	0.83	0.87	90	0.28	0.17	
Ітідагіоп		1986	0.12	6.12	000	0.00	0.00	0.00	0.0	0.00	9.0	0.00	8	0.05	
Demand-2		1987	0.12	0.15	800	0.0	000	000	000	8	000	800	000	0.08	
(m3/sec.)		8861	0.07	8	0.02	8.0	0.00	0.00	0.00	80.0	900	800	800	800	
		6861	0.10	0.15	800	0.00	800	000	000	000	000	8	8	800	
		98	0.12	0.15	000	800	800	80	000	000	000	000	000	8 6	
		8	80.0	0.15	000	80.0	000	800	000	000	000	8	000	200	
		1992	900	0.13	0,0	000	8.0	800	000	000	000	200	900	5 6	
		1993	0.12	0.15	0.0	00:00	000	000	000	00	8	8	8	6	
		1994	0.12	900	000	000	000	8	8	8	8	3 8	3 6	5 6	
		566	0.12	800	8	000	800	8 8	3 8	8 6	3 8	3 8	3 8	3 6	
				:			3	<u>}</u>	3	3	3	3	3	3	

••• Domestic Water Demand (m3/sec.)	0.003	0.005	0:003	0.003	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.003
1986 Water Loss (m3/sec.)					:			;		;		
Surface water area (km2)	0.27	07	0.27	0.27	0.27	0.27	o.	0.27	0.27	0.27	0.27	0.27
Potential ET (mm)	₹	181	219	208	8	7	147	128	.	158	162	2.
Water loss (1,300 m3)	æ	\$	7	67	Z	4	33	4	84	51	S	\$
Total of outflow (1,000 m3)	387	9	3	2	24	Ç,	\$	55	%	92	\$6	8
Reservoir Storage (1,000 m3)	105	5	105	50	105	201	50	105	5	8	50	8
Water Balance (I-O)	679	303	57.1	ŝ	1,635	2,530	3,895	5,298	5,384	3,950	2,546	1,291
Water Balance incld, reservoir (1,000 m3;	679	303	571	\$	1,635	2,530	3,895	5.298	5,384	3,950	2,540	1,291
	501	105	105	105	105	50	50	105	105	105	105 	S
Required Reservoir Capacity (1.000 m3)	205	:									J	
Deficit ****	0	0	0	0	0	0	0	٥	٥	0	0	0
	:	9		:		-						
1987 Water Loss (m3/sec.)												
Surface water area (km2)	0.27	0.27	0.27	0.27	0.27	0.27	0.23	0.27	0 1:1	0.27	0.27	0.27
Water loss (1,000 m3)	4	S.	-	5	Z	4	84	₹	45	ζ.	걿	\$
Total of outflow (1,000 m3)	387	43	. \$8	ଛ	78	ŝ	61	\$\$	80	8	\$	274
Reservoir Storage (1,000 m3)	ā	501	105	50	5	9	Ş		105	50	105	8
Water Balance (I-O)	679	182	492	828	306	2,358	4 405	S. 446	5,279	3,950	2,080	1.02
Water Balance incld, reservoir (1,000 m3)	0,0	8	405	828	1.38	2,358	4,405	5,446	5,279	3.930	2,0%0	1,022
	Š	<u>5</u>	105	105	105	105	8	5	105	50	105	Š
Deficit ****	Ç.	0	•	0	0	0	Φ.	0	0	0	0	0
	:	٠										
1988 Water Loss (missec.)	:			;		•	1	;	;		1	. !
Surface water area (km2)	0	0.27	6.7	0.27	0.27	0.27	770	0.57	0.27	0.27	0.27	0.27
Water loss (1,000 m3)	4	e r .	7.	62	\$	\$	₹ :	,	3	₹ :	S.	64
Total of outflow (1,000 m3)	239	F	123	S	50	85	5	55	% %	\$	3	ţ.
Reservoir Storage (1,000 m3)	50	5	105	53	105	50	<u>10</u>	105	5	105	Š	8
Water Balance (I-O)	762	755	487	186	1.623	2,813	2,508	4.479	3,545	3,367	2,021	 8
Water Balance incld. reservoir (1,000 m3)	762	755	487	981	1.623	2,813	2,508	4.479	3,545	3,367	2,021	891
	502	20.	105	105	105	S	501	105	50	105	5	8
Deficit mean	0	•	O	0	0	٥	0	0	0	0	0	٥
(/ C / / / / /										٠		
1909 Water Loans (morsec.)	0	4	3	8	*	5	C	£ <	8	- F	60.0	4
Surface water area (km.z.)	7770	7.00	77.0	77.0	7	7 7	, Q	77.5	77.0	77.0	7.5	3 6
Water (OSS (1,000 m3)	ì	`		5 8	3 8	? 8	? :	; ;	2 1	5 :	4 1	ĵ
total of outflow (1,000 m.s)	* 1	1		2 ;	e	6 3	ē š	ce s	8 :	8 5	3 3	7/7
Reservoir Storage (1,000 mJ)	<u> </u>	ر کن	(4	<u>s</u> :	<u>8</u>	6	3	5	3	507	<u>s</u>	<u>S</u>
Water Balance (I-O)	25	7		996	1.952	3,046	8	4,326	3,689	3,063	1.777	₹ 30
Water Balance incld. reservoir (1,000 m3;	220		:	260	1.952	8	3.38	4.326	3.689	3,063	<u>;</u>	\$3 \$3
	Š	~	105	105	<u>5</u>	9	Š	105	201	105	S	105
Deficit ****	0	٥		0	0	•	0	0	0	0	0	0
:												
1990 Water Loss (m3/sec.)		. *										٠
Surface water area (km2)	0.27	0.27	0.27	0.33	0.27	0.27	0.27	0.27	0.77	0	0.27	0.2
Water loss (1,000 m3)	47	\$	7	69	\$	\$	3 4	4	2	5	K	\$
Total of outflow (1.000 m3)	387	4	æ	8	78	8,	79	S	8	\$3	\$	274
Reservoir Storage (1,000 m3)	Š	105	0	105	<u>8</u>	5	9	105	105	105	50.	8
Water Balance (I-O)	375	\$	569	328	1,018	1,703	2,640	3,366	4,4	3,972	2,219	873
										:		-

	٠									-		
Water Balance incld, reservoir (1,000 m3)	375	0	569	328	1,018	1,703	2,640	3,366	4.446	3,972	2,219	873
	Š	0	105	105		105	8	S .	105	105	105	8
Deficit ****	0	Ş	0	0	٥	0	0	0	0	0	٥	0
	:		:									
1991 Water Loss (m3/sec.)	:	1		:								
Surface water area (km2)	0.27	0.27	0.27	0.27	0.27	120	0.27	0.27	0.27	0.27	0.27	0.27
Water less (1,000 m3)	47	66	71	\$	8	3	₹	4	5	5	83	\$
Total of outflow (1,000 m3)	£83	4	25	8	78	ŝ	19	55	85	8	\$	3
Reservoir Storage (1,000 m3)	š	20	22	50.	105	202	105	501	<u>5</u>	50	105	20.
Water Balance (I-O)	288	33	285	¥,	788	1,342	2,062	3,599	3,667	3,467	2.502	1.683
Water Balance incld, reservoir (1,000 m2)	288	Ş.	581	×.	788	1,342	2,062	3,599	3,667	3,467	2,502	1,683
	105	35	501	105	105	8	100	105	103	105	503	103
Deficit ****	0	0	0	0	0	0	0	0	0	0	0	0
	•	:										
1992 Water Loss (m3/sec.)	:											
Surface water area (km2)	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Water loss (1,000 m3)	47	ŝ	17	. 67	Z	3	84	4	45	15	S	Ş
Total of outflow (1,000 m3)	176	387	114	£	78	\$	19	53	58	\$	65	8
Reservoir Storage (1,000 m3)	105	105	105	50	8	105	103	5	103	105	103	8
Water Balance (I-O)	868	255	194	530	857	1,305	2,201	3,236	3,522	3.058	1,766	8
Water Balance incld. reservoir (1,000 m3;	868	25	46	5,5	857	1,305	2 201	3.236	3,522	3,058	1.766	883
	105	105	103	105	502	105	105	105	105	105	105	105
Deficit ***	0	0	0	0	0	.0	0	0	0	0	0	0
1993 Water Loss (m3/sec.)												
Surface water area (km2)	0.27	0.27	0.27	0,27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Water loss (1,000 m3)	47	8	7.	63	Ŷ	\$	₩	4	4	51	25	63
Total of outflow (1,000 m3)	387	£23	117	8	78	ŝ	61	8	83		8	243
Reservoir Storage (1,000 m3)	502	105	0	Š	8	8	25	105	105	105	105	8
Water Balance (I-O)	397		142	369	757	1.391	1,823	2,249	3,402	2.958	2,118	1,435
Water Balance incid. reservoir (1,000 m3)	397	0	142	69.	757	1,391	1.82	2,249	3,402	2,958	2,118	1,435
	Š	O	105	503	9	103	103	105	105	105	3	3
Deficit *****	0	-1	0	0	0	0	0	0	0	0	٥	•
1994 Water Loss (m3/sec.)		1										
Surface water area (km2)	0.27	0.27	0.27	0.27	0.27	0.27	0.23	0.27	0.27	0.27	0.27	0.27
Water loss (1.000 m ³)	7.	ŝ	7,	29	2	3	*	4	₹	51.	23	\$
Total of outflow (1,000 m3)	š	215	\$	8	78	83	3	\$	88	જ	8	3
Reservoir Storage (1,000 m3)	Š	105	105	8	30	503	503	503	105	105	105	105
Water Balance (J-O)	379	248	433	<u>z</u>	\$	1,498	2.678	3,562	3.841	3,033	1,313	198
Water Balance incid, reservoir (1,000 m3)	379	248	433	38	2 6	1,498	2,678	3,562	3,841	3,033	1,313	861
	50	201	105	105	8	100	105	501	105	105	38	105
Deficit *****	0	٥	0	0	0	0	0	0	0	0	0	0
1995 Water Loss (m3/sec.)												
Surface water area (km2)	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.23	0.27	0.27
Water loss (1,000 m3)	4	65	17		Z	\$	4 80	7	₹	5	S	\$

280 84 80 78 59 61 55 58 65	105 6 101 103 105 105 105 105 105	199 6 101 103 710 1,123 2,207 2,277 2,310 1,767 778	6 101 103 710 1,123 2,207 2,277 2,310 1,767	6 101 103 105 105 105 105 105 105	0 0 0 0 0 0 0 0 0						0 0 0 0 0 0 0 0 59-			0 0 0 0 0 0 0 2		· · · · · · · · · · · · · · · · · · ·
		-					0	0	0	٥	\$9	Ó	0	-7	0	c
379	50	·: 86	8	105	0		0	0	0	0	0	0	0	0	0	•
otal of outflow (1,000 m3)	Reservoir Storage (1,000 m3)	Water Balance (J-O)	Water Balance incld, reservoir (1,000 m3)		Deficit ****	Deficit (1,000 m3)	1986	2861	1988	1989	0661	1661	1992	1903	1994	100.

0000%000000

Table IV. 7 - Water Balance Calculation (Upper Tapoung Scheme)

\$					•								
Kunoti	E)	(maysec)											
7.7.8	ran.	ξ.	9	Made.	Apr. May			_	ï	ਤੋਂ ਵੇ			
,			ę ż	ริ	3 8	₹:	? :	7 8	7 5	2 :	¥. §	3 3	3
	0 1	800	ŝ	00	500	5	0	(2) (2)	50,0	\$:	0.27	0.21	0
		0.08	0.05	0.03	000	6	0.16	0.27	0.37	0,33	0.27	0.19	0.12
		0.08	8	3	90.0	0.10	0.17	0.16	0.28	0.24	0.23	0.17	0.11
-		900	ð	0.02	800	0.11	0.17	0.22	0.28	67.0	0.24	0.19	0.13
i.		0,07	30	0.03	0.03	0.07	0.13	0.17	0.25	0.33	0.28	0.21	0.13
-		80.0	0.05	0.03	0.03	8	0.15	0.30	0.51	0,45	9.36	0.24	0.15
2		0.10	90.0	0.0	0.03	8	0.15	0.27	0.36	0.33	0.26	0.18	0.11
:		0.07	9.0	0.03	0.03	0.05	0.07	0.15	0.27	0.27	0.21	0.15	0.10
- -	1994	800	3	90.0	90.0	0.13	0.18	0.36	0.43	0.41	9,34	633	0.17
		90.0	900	0.0	0.05	0.09	0.10	0.18	0,22	0.23	61.0	0.14	8
Injection D.	986	100	8	Š	Ö	5	8	8	S	8	8	60	Š
	2.30	000	Š	000	8	8	8	8 8	8	8 8	88	3 6	3 6
	1988	0.02	0.02	900	8 8	88	800	8 8	800	800	8 8	200	5 5
-	686	0.02	8	0	800	000	000	000	000	000	000	0.0	00
A	1990	0.03	900	0.03	0.0	8	8	0.0	800	800	000	0.02	00
		0.05	8	0.05	8	8	800	000	8	8	0.01	0.02	0.0
-	1992	0.02	90.0	90.0	0.02	9:0	0.0	0.0	9.0	0.0	0.0	0.02	0.0
7	88	0.03	8	90:0	0.02	8.0	0.00	0:00	0.0	0.00	3.0	0.01	0.01
-	76	0.03	9	8	800	8	0.00	0.0 0.0	8.0	0.00	0.0	0.01	0.0
	\$\$	0.03	0.05	0.02	0.0	8.0	800	0.00	8	89	8.0	0.02	0.01
*** Domestic Water Demand (m3/sec.)	_	2002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.00	0.002	0.002	0.000
1986 Water Loss (m3/sec.).			:	÷									
Surface water area (km2)		0,33	0.33	0 33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Potential ET (mm)		178	0.5	170	174	152	126	75	911	117	135	Ż.	4
**** Water loss (1,000 m3)		3	8	67	69	8	ጸ	67	4	\$	53	3	5
Total of outflow (1,000 m3).		82	ä	98	30.	3 6	55	Ħ,	51	S	89	101	\$
Reservoir Storage (1,000 m3)		54 54	240	162	82	5	240	3	240	240	240	97	34
Water Balance (I-O)		326	162	87	E.	294	Š	\$42	1,981	1.073	913	989	\$29
Water Balance incld. reservoir (1,000 m3	(1)	326	162	87	22	294	š	843	1.081	1.073	913	680	88
		340	162	£8	£	240	240	246	25 95 95	340	340	240	240
Required Reservoir Capacity (1,000 m3)	 ကို	3											
Deficit ****		o o	0	0	0	•	0		0	0	0	0	٥
1987 Water Loss (m3/sec.)									-				
Surface water area (km2)		0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Water loss (1,000 m.3)		21	6	. 63	%	8	ጵ	49	4	\$	53	79	5
Total of outflow (1,000 m3)		126	217	212	£	8	SS	X.	5	22	65	8118	8
Reservoir, Storage (1,000 m3)		549	50	143	9	19	212	240	240	54 54	240	240	3
Water Balance (I-O)		326	Ž,	91	19	212	582	895	1,177	1.038	913	623	475
Water Balance incid. reservoir (1,000 m3	m3:	326	143	9	19	212	285	895	1,177	1,038	913	ğ	\$73
		8	4	92	9	212	240	240	25	8	2	3	3
Deficit ***		0	0	0	٥	٥	0	0	0	0	ф	0	•
													,

1988 Water Loss (m3/sec.)

	٠												
Surface water area (km2)	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	
Water loss (1,000 m3)	ς.	S :	5	S	8 :	ଛ :	\$	4	\$:	%	8	8	
Local of outflow (1,000 ms)	3 5	2	3 3	2	8 8	2 5	X	ร	22.5	8	114	Se ;	
Moser Belgmon (1.000 m.s.)	3	¥ £	3 5	3 5	3 5	3 6	3 7	3 2	3 8	3 8	3 5	3 5	
Water Balance incld. reservoir (1,000 m3)	8 8	22	임원	3 6	}	638 638	8 58 878 878	8 8	\$ \$	2 S	574	5, 4, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5	
	240	5 7	120	202	욹	9,	340	240	3	9	8,	97	
Deficit was	0	0	o:	0	0	٥	0	0	٥	0	0	Ö	
1989 Water Loss (m3/sec.)		f	:	٠			٠						
Surface water area (km2)	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0,33	0.33	0.35	0.33	0.33	
Water loss (1,000 m3)	\$1	8	6	8	8	8	\$	4	4	53	150	22	
Total of outflow (1,000 m3)	120	217	168	r	8	\$3	X	51	ĸ	\$6	8	\$	
Reservoir Storage (1,000 m3)	97	240	115	13	47	240	540	240	240	240	240	240	
Water Balance (I-O)	8	. 115	13	4	281	632	776	939	930	829	635	490	
Water Balance incld, reservoir (1,000 m3;	8	115	13	74	381	632	776	939	930	829	635	8	
	240	115	ដ	47	240	97	54	240	24	240	540	240	
Deficit ***	0	Ó	0	0	Ö	0	0	0	0	0	0	0	
,	1	:											
1990 Water Loss (m5/sec.)	: :		: ;	: ;	. :	;	: ;			;			
Surface water area (km2)	0.33	6.3	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	
Water loss (1,000 m3)	5	\$. <u>.</u>	. 67	3	8 :	ያ :	4	3	\$	53	\$	5 , 1	
Total of outflow (1,000 m3)	126	217	157	128	8	X	X.	Š	S.	es S	107	£	
Reservoir Storage (1,000 m3)	3	8	13	ጽ	0	118	98	9	35	240	240	240	
Water Balance (I-O)	308	: :	፠	4	118	8	632	870	1.83	: ::	88	205	
Water Balance incld, reservoir (1,000 m3;	308	131	*	0	118	38	632	870	8	331	899	205	
	3	ਜ਼ ਜ਼	አ	0	90	25°	\$	9	240	5	540	540	
Deficit ****	0	•	0	4	0	0	0	0	0	Ó	0	0	
					•								
1991 Water Loss (m3/sec.)		;		;	;	;	;	;	;		. ;	į	
Surface Water area (km2)	0.33 5:	0.33 5.33	F (0,33	0.33	0.33	0.33	0.33	633	3	0.33	() ()	
Water Joss (1,000 ms)	ñ ;	ጽ :	ò	3 3	8 ;	2 (÷;	\$;	\$;	3 8	3	<u>ن</u>	
portion (1,000 ms)	114	77.6	<u> </u>	e s	8 3	8 8	\$ 5	7 6	3 5	2 5	717	8 5	
Water Balance (LO)	2 2	} { }	į	2 2	ţ	Š	3 3	7 × × ×	3 2	3 5	3 6	₹ 5	
Water Balance incld. reservoir (1.000 m3)	336	5.5	8 8	1	8	838	, \$	1.565	366	1.125	747	\$ \$	
	240	4.	۶,	8	88	3,	9	240	240	240	9	9,	
Deficit ****	0	٥	o	0	0	0	٥	٥	٥	٥	0	0	
1902 Water Loss (m3/sec.)		 											
Surface water area (km2)	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0 33	7,7	
Water loss (1.000 m ³)	51	8	. 6	3	8	S	5	3	3	8	. 4	Ç	
Total of outflow (1,000 m3)	8	8	232	134	\$	S	¥	51	8	8	211	æ	
Reservoir Storage (1,000 m3)	240	240	8	8	21.	%	240	240	240	240	Ą	340	
Water Balance (I-O)	8	8	6 6	ដ	89	\$	914	1,153	1,051	853	593	463	
Water Balance incld. reservoir (1,000 m3)	8	8	69	ส	89	\$	914	1,153	1,051	853	593	463	
	240	8	\$	ដ	89	240	55 95	240	549 549	240	240	240	

Now Water Loss (1000 ms) Subset over eace (1000 ms) Subset over eace (1000 ms) Subset over eace (1000 ms) Subset over eace (1000 ms) Subset over (1000 ms) Subset over (1000 ms) Subset Loss (1000 ms)	Deficit ****	ပ	o [:]	0	٥	0	•	٥	0	0	0	0	٥	
91	1993 Water Loss (m3/soc.) Surface water area (km2)	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	
Courty 125	Water loss (1,000 m3)	51	S,	67	%	8	ጸ	Ó‡	ş	\$	53	10	73	
Columbia 246 240 156 0 0 15 17 250 240	r outflow (1,000 m3)	126	21.3	13	11.8	\$	\$	X	51	23	155	¥	ş	
1985 198 25 44 81 217 552 972 887 654 553	oir Storage (3,000 m3)	240	240	136	0	0	8	217	2	5. 6.	94 94	8	240	
Page-rore (1,000 m3); 3,08 1186 0 0 811 217 552 922 899 654 523 100 m3) 240 136 0 0 811 217 240 240 240 240 240 240 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Balance (1-O)	308	136	ά	¥	818	217	552	225	892	634	523	\$	
240 136 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Balance incld. reservoir (1,000 m3;	308	136	0	0	81	217	552	922	892	55	523	\$	
12) 0.33 0.33 0.33 0.33 0.33 0.33 0.33 0.3		260	138	o	0	18	217	3	240	2 5	350	95	8	
1,	***	0	0	-23	2	٥	٥	٥	0	٥	0	٥	0	
Color			:											
1,	Loss (m3/sec.)												;	
Color Colo	e water area (km2)	033	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	
Oom3/1 126 171 73 77 66 55 54 51 52 64 102 00m3/1 226 226 238 240	loss (1,000 m3)	2	ŝ	6	\$	\$	8	3	\$	3	S	19	23	
100 m3 1240	of outflow (1,000 m3)	138	171	12	Þ	\$	\$\$	¥	5.	ĸ	\$	301	74	
Technoli (1,000 m3; 265 1150 128 379 520 655 1,151 1,131 1,231 1,1351 1,074 730 (1,000 m3; 265 1160 138 240 240 240 240 240 240 (1,000 m3; 265 1160 138 240 240 240 240 240 240 (1,000 m3; 240 240 240 240 240 240 240 (1,000 m3; 240 240 240 240 240 240 240 240 240 240	oir Storage (1,000 m2)	250	240	8	238	8	3	55 55	35	3	240	240	34	
recervoir (1,000 m3; 265, 166, 238, 379, 520, 655, 1,151, 1,331, 1,251, 1,074, 730, 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Balance (I-O)	265	8	238	379	320	655	1,151	1,331	122.1	1.074	730	612	
240 160 238 240 240 240 240 240 240 240 240 240 240	Balance incld, reservoir (1,000 m3)	265	8	238	379	520	655	1,151	1,331	1,251	1.07	730	612	
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		240	3	338	240	240	240	3.80	240	3,	240	340	345	
100 (133 (133 (133 (133 (133 (133 (133 (٥	0	O.	0	0	٥	0	0	٥	0	0	0	
12) 0.33 0.33 0.33 0.33 0.33 0.33 0.33 0.3			1											
Com 3) 15. 100 m3) 15. 100 m3	Loss (m3/sec.)	6.0				22.0	22.0	200	5		,,	52.0	6	
Down (1,000 m3)	S WAIGH MIGH (MING)	3	; ;	} S	3 9	3		3	9	G 7	6	3	3 6	
Oom (1,000 m3) 1.25 184 113 102 90 33 34 31 32 93 112 cre (1-00 m3) 240	loss (LUCO m.s)	ñ ġ	£ 5	ò :	è :	3 3	2 5	3	\$;	ş :	? ;	ō;	À İ	
Om3) 1362 203 207 244 405 240 240 240 240 240 240 240 240 240 240	f outflow (1,000 ms)	ij	ž	113	701	8	3	ጸ	ለ ለ	ž	8	711	12	
Cer (1-C) 362 203 207 244 405 446 679 789 791 679 482 Cer incid. reservoir (1,000 m3; 362 203 207 244 405 446 679 789 791 679 482 Cer incid. reservoir (1,000 m3; 362 203 207 244 405 446 679 789 791 679 482 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	oir Storage (1,000 m3)	57	8	ğ	20	24 0	5	3	3	ş	욹	35	. 740	
0 m3) 1988 0 <	Bajance (1-O)	36	ģ	8	2	₹Ģ	4	629	789	791	679	482	398	
240 203 207 240 240 240 240 240 240 240 240 240 240	Balance incld, reservoir (1,000 m3)	362	SS	202	73	2 04	34	679	789	Š	629	482	38	
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	•	540	8	202	540	740	5 6 0	5 4 0	240	240	340	3	340	
1986 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		0	0	0	0	٥.	0	0	٥	0	0	٥	٥	
1986 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0														
		<	ć	<	<	<	•	<	<	<	<	<	<	
	0061	> <	> <	> <	> •	> <	> <	> <	> <	> <	> <	۰ د	> 0	
	/261	> .	→ •	> .	D 4	> .	o (> •	S	> ⋅	→ ·	> •	> ·	
	1988	Ö	0	0	0	0	Ó	0	0	0	0	0	0	
	1989	0	0	0	0	0	Ó	0	0	0		0	o	
	1990	0	0	0	4	0	0	0	0	0	٥	0	0	
	1661	0	0	0	0	0	0	0	0	0	0	0	0	
	1992	0	0	0	Ö	0	0	0	0	0	o	0	0	
	1993	•	0	ກຸ	4 ∞	0	0	0	0	0	0	ö	0	
	1994	۰ ۰	: • •	φ •		۰ ۵	٥.	0 1	۰ ۰	ο,	•	0 1	٥.	

0000400600

Table IV. 8 Water Balance Calculation (Upper Kapheu Scheme)

Kapheu Scheme

,	(m3/sec)											
	Jan. Feb.	Mar	r. Apr	May	Jun.	Jul.	Aug.	Sept.	ઠું	Nov.	ž	Total
	_	82	3	2		ይ			ድ	31	ĝ	31.
1986	4	020	0.18	0.18	0.55	0.83	1.30	1.78	7. 2.	1.48	1.14	0.74
	4	120	0.17	0.24	0.42	0.85	1,41	1.97	1.7	1.48	š	40.0
1988	0.40	0.29	0.22	0.31	0.50	0.92	0.87	1.53	1.27	7	0.92	0.56
6861	0.35	0.21	0.13	0.20	0.60	0.93	1.16	1.48		1.26	0.97	0.62
0661	4	0.27	0.18	0.16	0.41	0.76	8	1.53	1.98	. 88	1.24	0.78
8	0.51	0.23	0.14	0.12	0.39	0.68	1.41	2.55	2.32	8	1.28	0.81
1892	0.53	0.35	0.22	0.17	0.22	92.0	3	8.	1.78	4	86.0	0.61
2661	0.38	0.23	0.13	0.13	0.25	0.36	0.70	1.32	1.43	99:	9.76	0.48
700	8	0.19	0.23	0.38	0.61	8.0	1,76	2.10	2.06	1.71	1.16	0.82
\$66	0.48	030	150	17	0.38	0.49	0.90	1.13	1.21	8:	0.72	24.0
	} :	:										
frieation Do		0.32	0.10	20.0	0.00	0.0	8.	8	0.01	0.00	8.0	0.17
		0.36	0.13	0.02	800	8	80.0	0.0	0.02	0.00	0.01	17
8861		800	0.16	0.02	800	8.0	0.0	8	0.02	800	0.01	0.21
6%61		99	0.10	0.03	000	000	800	800	0.03	0.0	0.01	0.21
0661		0.35	0.0	0.05	000	8	9,0	800	10:0	0.00	000	0.21
1661		95,0	0.20	90.0	8	80	8	0.0	0.00	9.0	0.01	61.0
286		3	0.22	0.05	800	900	0.00	0.00	0.0	0.03	0.01	0.21
1661	0.33	0.35	0.13	8	00.0	0.05	0.0	00.0	0.00	0.05	0.01	0.21
7661		0.35	0.10	0.03	8	8.0	8.0	800	.000	0.02	0.01	0.21
9001		0.32	0.20	800	800	0.00	0.00	0.0	0.02	0.0	0.01	0.21
		!				-						
"" Domestic Water Demand (m3/sec.)	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
										:	:	: '
Surface water area (km2)	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Potential ET (mm)	145	181	219	308	83	[+]	147	23	₹ 9		162	151
*** Water loss (1,000 m3)	ដ	83	3,	엻	3	ដ	ន	ន	ដ	X 3 :	አን !	8 9
Total of ourflow (1,000 m3)	8	\$	318	136	41	ጸ	5	23 23	S	23	7	3
Reservoir Storage (1.000 m3)	395	395	¥	395	395	Š	86	Š	395	302	333	382
Water Balance (1-0)	. 656	ž	413	710	1.819	2,524	3.847	5,125	5,111	515	3.79	1,878
Water Balance incld, reservoir (1,000 m3)	959	*	4 3	710	1,819	2,524	3,847	5,125	5,111	4.315 2.35	25 55 25 55 26 55 27 55	1.878
	395	7. 7.	38	395	398	398	395	362	Ç,	ç	5665	ŝ
Required Reservoir Capacity (1,000 m3)	cke	•	•		•	<		<	<		c	c
Deficit ****	•	0	0	0	5	>	>	>	•	>	>	>
1987 Water Loss (m3/sec.)			÷				!	;	•		:	:
Surface water area (km2)	0.13	0.13	0.13	0.13	0.13	0.13	0.13	110	0.13	U.1.5	C.15	3.5
Warer Jose (1.000 m3)	ដ	25	Z	Ŗ	2	ដ	ដ	8	ដ	K)	13	3
Total of outflow (1.000 m3)	604	<u>%</u>	380	35	\$	R	Z	ęģ	55	Ċ.	\$	288
	395	8	84.	217	38	395	36	395	395	395	382	395
Wart Balance (I-O)	30	148	217	5	1,469	2.578	4.130	5,632	4,902	4316	3,011	1,515
Water Balance incld mervoir (1000 m3)		148	217	92	1,469	2,578	4,130	5,632	4,902	4.316	3.011	1,515
		84	217	Š	395	395	38	395	33	395	332	388
Deficit sess	0	0	0	0	0	٥	0	0	0	0	0	0
114141	•											

						•						
1988 Water Loss (m3/sec.)												
Surface water area (km2).	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Water loss (1,000 m3)	7	23	7	32	33	Ħ	ដ	8	£1	×	×	7
Total of outflow (1,000 m3)	35	83	\$	8	3	1,9) æ	*	9	É	3 \$	905
Reservoir Storage (1,000 m3)	36	395	395	305	Š	Ş.	. Ş	ž	ě	ě	ğ	9 9
Warer Balance (I-O)	2,	3	Ē	1110	- 70.	2766	2,407	4 4 K	9636	25	720	
Water Balance incld. reservoir (1,000 m3)	2	3	į č	2 1	200	2755	1604	4410	3,020	200	66/2	4 6
	38	30	36	305	395	38	386	36.	366	36		30.
Deficit ****	۰,	•	٥.	0	0	0	0	0	0	0	0	0
1989 Water Loss (m3/sec.)		*										
Surface water area (km2)	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Water loss (1.000 m3)	ដ	23	2.	8	33	Ę	ន	8	ß	52	ž	72
Total of outflow (1,000 m3)	728	88	321	50	4	8	۱ ۲	28	108	3	3	8
Reservoir Storage (1,000 m3)	395	395	• •	ผ	395	395	395	395	395	395	395	305
Water Balance (1-O)	8	•	: 13	439	1.953	2,783	3,478	4,329	4.072	3,700	2.846	4.
Water Balance incld, reservoir (1,000 m3)	8	0	23	439	1.953	2.783	3,478	4,329	4,072	3.70	2846	.477
	395	0	XI	£	395	395	395	395	395	395	395	395
Deficit ***	٥	• ¹	Ó	O	0	0	•	٥	0	0	0	0
1990 Water Loss (m3/sec.)		÷										
Surface water area (km2)	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0 13
Water loss (1,000 m3)	E	83	3,	33	25	R	23	8	ĸ	X	2,	
Total of outflow (1,000 m3)	8	892	23	172	3	8	3 1	8 8	1 3	2	3	, ₂ ,
Reservoir Storage (1,000 m3)	Š	395	15.	395	395	395	395	395	8	30	305	ě
Water Balance (I-O)	3	37	410	633	1,453	2,326	3.042	4.455	5.463	4.858	3	Š
Water Balance incld, reservoir (1,000 m3,	8	¥	410	633	1.453	2326	3.042	4.455	× 463	888	3	8
	395	Ä	368	395	365	395	395	395	\$	ě	ě	Š
Deficit ****	0	0	0	0	0	Ó	0	0	٥	0	•	ò
			:								. :	
1991 Water Loss (m3/sec.)												
Surface water area (km2)	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Water loss (1,000 m3)	ដ	%	Ŗ	æ	31	ध	ន	ឧ	ដ	អ	ង	42
Total of outflow (1,000 m3)	Š	88	585	302	4. E.	ደ	Ë	82	ጽ	33	69	88
Reservoir Storage (1,000 m3)	382	35	Ç	0	8	395	395	395	33	395	393	395
Water Balance (I-O)	88	62	-146	106	1,097	2,136	4,128	7,197	6,390	5,448	3,655	2,019
Water Balance incld, reservoir (1,000 m3;	8	29	0	8	760.	2,136	4,128	7.197	6.39	5,448	3,655	2,019
	25	\$	•	8	395	395	<u>%</u>	8	33	395	395	395
Deficit ****	0	0	-146	Ó	ö	0	0	0	0	٥	0	٥
1992 Water Loss (m3/sec.)		2 · · ·		1								
Surface water area (km2)	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Water loss (1,000 m3)	ដ	82	Ą	32	31	ä	ន	ន	ដ	23	ĸ	73
Total of outflow (1,000 m3)	385	853	029	183	£	ድ	E	83	8	8	8	588
Reservoir Storage (1,000 m3)	38	395	383	ž.	395	395	395	395	395	395	395	395
Water Balance (I-O)	1.429	383	¥	291	932	2,338	4,103	5,451	4.975	4,147	2.863	454
Water Balance incld. reservoir (1,000 m3)	1,429	383	Ż	\$91	932	2,338	4,103	5.451	4.975	4,147	2.863	1.434
		:							!	:		

	395 0 0	EN 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	00000000
	395 395	0.13 0.13 25 25 395 395 3,150 2,300 3,150 2,300 3,150 2,300 0,13 0,13 25 28 395 395 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	000000000
	398	## 10	000000000
	395 395 0 0	0.13 0.13 23 28 395 395 2244 3,913 395 395 0 0 0 0 31 28 395 395 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	000000000
	395 35 0	0.13 0.13 3.35 3.35 3.35 3.35 3.35 3.35 3.35 3	000000000
·	395.	0.13 31 42 145 771 771 771 395 0 0.13 395 1,988 1,988 1,988 1,988 1,362 1,362 1,362 0 0 0 1,362 0 0 0 0 0 1,363 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	000000000
	395	0.13 35 146 146 146 146 146 146 146 146 146 146	00000000
	₩ 0	23	000000000000000000000000000000000000000
	395 383	0.13 907 907 907 907 907 907 907 907	00000000
	Deficit ****	Surface water area (m2) Surface water area (m2) Water loss (1,000 m3) Total of outflow (1,000 m3) Reservoir Stotage (1,000 m3) Water Balance (1-0) Water Balance incid. reservoir (1,000 m3) Deficit. *** Surface water area (km2) Water Loss (1,000 m3) Total of outflow (1,000 m3) Reservoir Storage (1,000 m3) Reservoir Storage (1,000 m3) Water Balance (1-0) Water Balance (1-0) Water loss (1,000 m3) Total of outflow (1,000 m3) Total of outflow (1,000 m3) Water loss (1,000 m3) Total of outflow (1,000 m3) Water loss (1,000 m3) Total of outflow (1,000 m3) Water loss (1,000 m3) Water Balance (1,00) Water Balance (1,0) Deficit (1,000 m3) 1986 1987 1988 1989 1990 1991 1992 1993	

Table IV. 9 Water Balance Calculation (Lower Xe Set Scheme)

Xe Set Scheme

Supoff		3/sec)	<u>.</u>	:									
	S.	Jan. F	Feb. N	Mar.	Apr. May	ay Jun.			Aug. S	Sept.	Oct. Nov.	w. De	E. Total
		33	28	₩.	ይ	E	ጸ		E	ድ		8	31
Runoff	1986	3.99	2.50	1.73	2.61	13.45	16:02	31.84	42.48	43.12	28.03	17.16	7.52
	1987	4.35	2.74	1.70	8.0x	10,12	8.63	36.46	43.50	42.91	28.20	13.27	6.14
	1988	4.30	3.59	2.57	6.58	12.65	23.62	19.33	36.23	27.58	24.95	13.74	2.60
	1989	3,85	2.29	<u>-</u>	3,75	16.25	8	24.95	35.91	30.61	22.42	12.77	5.76
٠	1990	35	8:	1.67	1,33	8,16	15.25	21.7	21.80	39.27	30.90	15.87	5.97
	<u>&</u>	38.	255	230	2.65	8.09	11.29	32.82	41.87	41.71	37.18	17.07	9,66
	1992	4.76	2.56	1.86	1.98	4.15	15.89	28.65	45.34	32.12	20:26	9.55	5.87
	1993	3,49	2.48	30	2.05	5.55	5.38	14.31	27.39	33.77	15.24	7.26	4
	1994	2.58	1,75	1.48	88.4	10.51	14.87	28.86	30.69	32.1\$	19.32	8.8	5,11
	1995	3.49	2.49	1.88	181	5.25	5.56	12.39	20.49	23.79	16.71	8.32	4.71
	7001	. 400		-	2	8	8	8	8	01.0	: 970	770	. 0
irrigation LX	1980	600	} :	9 :	3 -	3 8	3 8	3 8	3 8	9 6	2 5	3 6	2 2
	1861	, co.	į 8	. O	300	3 8	3 8	3 8	3 8	3 6	3 5	× 500	8 6
	2261	9 6	3	?	0 0	3 8	3 8	3 3	3 8	9 4	3 6	* 6 5 5	0 0 0
	6861	0.70	4.	1.13 2.04	110	3 8	3 8	38	3 8) (9,0	8/70	0 X
	36	2 6	9	0.50	9	3 8	3 8	3 8	3 8	1 6	200	8 8	
	1867	9 6		9 ;	9 6	3 8	3 8	3 8	3 8	20.0	 	× 6	7 7
	2661	0.58	4	<u>.</u>	0.38	900	900	8 3	8 :	90.5	0.92	6 /.0	9
	1993	0.85	1.45	1.32	0.42	8	0.20	8	8	0.0	1.18	0.75	9,36
	1994	0.85	1.46	1.17	0.17	80	800	80	0.03	80	0.85	0.76	0.36
:	1995	0.85	94.	1.47	0,48	8	800	8	0.11	0.28	0.60	0.72	9.36
••• Domestic Water Demand (m3/s	(m3/sec.)	0.003	000	0.003	0,003	0.003	0.003	0.003	0.003	0.003	0.003	0,003	0.003
1986 Water Loss (m3/sec.)													
Surface water area (km2)		800	8	90.0	80	900	8	8	900	8	800	900	8
Potential ET (mm)		145	181	53.0	208	<u>\$</u>	4	147	138	3	158	35	151
Water loss (1,000 m3)		9	5	16		7	<u>≘</u>	Ξ	6	으	Ħ,	ဌ	: T
Total of outflow (1,000 m3)	. କୁ	2.293	3,40	3,183	202	F 3	39	61	11	497	13	1,718	830
Reservoir Storage (1,000 m3)	⊞3)	0	0	Ö	0	0	0	0	0	0	0	0	0
Water Balance (1-O)	٠	8,400	2,630	464	6,250	36,007	2,17	85,257	113,754	111,259	73,858	42,748	19,314
Water Balance incld. reservoir (1,000 m.	rvoir (1,000 m3)	8.400	2,630	464	6,250	36,007	54,172	85,257	113,754	111,259	73.858	42,748	19,314
		٥	0	O	0	0	0	0	0	0	0	Ļ	0
Ě	oir Capacity (1,000 m3)	٥	٠,			. '		•	•	,	•	,	,
Deficit ***		٠.	0	0	0	0	0	0	0	0	0	•	0
1987 Water Loss (m3/sec.)			٠										**
Surface water area (km2)		90.0	0.0	900	900	800	900	90.0	90:0	900	90.0	89	90.0
Water loss (1,000 m3)		2	:	16	53	14	2	=	0	2	11	ဌ	11
Total of outflow (1,000 m3)	ê,	2,293	3,575	3.535	30.	ដ	∞	19	11	802	1,625	000	983
Reservoir Storage (1,000 m3	m3)	0	0	0	0	Ó	0	Ö	٥	0	0	0	0
Water Balance (I-O)		9359	3.041	027	12,748	27.076	51.728	97,636	116,481	110,412	73.896	32,336	15,458
Water Balance incld, reservoir	Trosir (1,000 m3)	9,359	39.	1,027	12,748	27,076	51,728	97,636	116,481	110 412	73.896	32,336	15,458
		0	0	٥	0	0	0	0	٥	0	0	٥	•
Deficit ***		0	0	•	0	0	0	0	0	0	٥	0	0
1988 Water Loss (m3/sec.)													
					:								

Surface water area (km2)	800	900	8	8	8	900	90.0	90.0	8.0	8	900	90.0
Water loss (1,000 m3)	유	#	<u>•</u>	23	Ż	2	Ξ	\$	2	=	더	
Total of outflow (1,000 m3)	2,052	2,450	3,720	ដ	£1	82	61	-	63	733	1.932	983
Reservoir Storage (1,000 m3)	0	0	0	0	0	0	Ģ	Ö	Ö	0	Ö	o
Water Balance (I-O)	79.6	6,245	3.1.54	16,843	33,865	61,195	51.811	97.013	70,803	880.08	33,683	14,014
Water Balance incld. reservoir (1,000 m3)	9,467	6,245	3,154	16.843	13,865	61,195	51,811	97,013	70,803	880'99	33,681	14,014
	0		0	0	0	0	0	0	0	0	0	0
Deficit ****	0	0	0	0	٥	0	0	0	0	0	0	0
1989 Water Loss (m3/xec.)	:										٠	
Surface water area (km2)	0.06	0.08	900	900	9 0.0	8	800	8	900	900	900	90.0
Water loss (1,000 m3)	01	ដ	<u>.</u>	53	7	2	11	0	10	11	22	Ħ
Total of outflow (1,000 m3)	2. 4	3.575	3,221	314	77	18	61	11	1.056	2,045	2.048	983
Reservoir Storage (1,000 m3)	0	0	0	0	0	0	0		Ö	0	0	0
Water Balance (I-O)	8,369	1,959	630	9,415	43,498	66,337	66,789	96,165	78,284	58,002	31,040	14,442
Water Balance incld, reservoir (1,000 m3)	8,269	1,959	630	9,415	43,498	66,337	66,799	96,165	78,284	58,002	31,040	14,442
	0		0	0	0	0	0	0	0	0	0	0
Deficit ****	0	0	0	٥	٥	0	0	0	٥	0	0	0
					-	-						
1990 Water Loss (m3/sec.)												
Surface water area (km2)	8	90.0	9.0	99	8	8	S	.0 80.0	90.0	800	8	90.0
Water loss (1,000 m3)	2	<u>=</u>	9	X	14	ន	11	6	9	7	ဌ	11
Total of outflow (1,000 m3)	2,287	3,564	2,334	870	23	38	61	17	% %	888	1,733	88
Reservoir Storage (1,000 m3)	0	0	0	0	0	0	. 0	0	¢	٥	0	ø
Water Balance (I-O)	7.106	1.248	2,131	2,590	21.830	39,519	58,303	74,719	101,198	81,864	39,412	15,008
Water Balance incld. reservoir (1,000 m3)	7,106	1.248	2,131	2.590	21,830	39,519	\$8,303	74,719	101.198	81.864	19,412	15,008
	Ó	0	Ö	0	0	0	0	0	0	0	0	0
Deficit ****	0		Ф	0	0	0	0	0	0	0	٥	٥
1991 Water Loss (m3/sec.)	:											
Surface water area (km2)	9.0	900	900	8	80	900	900	0.0	90.0	98	90.0	90
Water loss (1,000 m3)	≌.	<u>n</u>	92	15	7	9	=======================================	٥	2	Ξ	1	=
Total of outflow (1,000 m3)	2,288	3.571	3,988	1,262	ដ	92	61	17	3	484	2:058	688 88
Reservoir Storage (1,000 m3)	0	0	0	0	0	0		0	0	0	٥	0
Water Balance (I-O)	586.	2,608	2,181	5,594	16,288	29,239	87.885	112,132	108,039	680'66	42.193	25,52
Water Balance incld, reservoir (1,000 m3)	7,989	2,608	2,181	5.594	16,288	29,230	87.885	112,132	108,039	680.66	42,193	\$ \$
	0	0	0	0	0	0	c	0	0	0	0	ò
Deficit ****	0	0	0	٥	•	0	0	0	0	0	0	0
1992 Water Loss (m3/sec.).												
Surface water area (km2)	90:0	90.0	800	800	90.0	90.0	90.0	90.0	8	90.0	0.06	90.0
Water loss (1,000 m3)	2	<u> </u>	91	51	14	9	. 11	٥	2	=	12	11
Total of outflow (1,000 m3)	1,564	3,494	4,066	90,1	22	81	2	17	81	2,490	2,060	983
Reservoir Storage (1,000 m3)	0	0	0	٥	0	0	0	0	0	0	0	Ö
Water Balance (I-O)	11,172	2,702	903	4, 142	11,087	41.181	76,729	121,414	83,229	51,783	22,691	14.746
Water Balance incld. reservoir (1,000 m3;	11,172	2,702	903	4,142	11,087	41.181	76.729	121,414	83,229	51.783	22,691	14,746
	٥	0	0	•	٥	0	0	0	0	0	٥	0

O	0	0	0	0	0	0	O	0	0

10	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						·							
10 10 10 10 10 10 10 10	10 0 0 0 0 0 0 0 0 0					.:								
10	10 10 10 10 10 10 10 10		0	` ·	0	, o	0	٥	0	0	0	. 0	0	٥
10 0.06 0.	10	1993 Water Loss (m3/sec.)		:										
10 10 11 12 13 14 15 15 15 15 15 15 15	12 12 13 15 15 15 15 15 15 15	rea (km2)	90:0	90.0	9.0	90.0	90.0	0.0	90.0	90:0	90:0	90.0	90.0	90.0
March Marc	Company Comp	00 m3)	2	#	16	55	14	2	==	•	10	::	ဌ	Ξ
1,000,000,000,000,000,000,000,000,000,0	1,000 1,00	(1,000 m³)	2,293	3,510	3,553	1.108	ដ	1,316	19	11	18	3,193	1,966	983
Total State	7.647 2.466 1,777 4,214 4,833 12,617 38,302 73,347 87,502 73,616 6,846 6,846 1,777 4,214 4,833 12,617 38,302 73,347 87,502 73,616 6,846 6,846 1,777 4,214 4,833 12,617 38,302 73,347 87,502 73,616 6,846 6,846 6,946	ge (1.000 m3)	φ.	٥	0	0	0	0	0	0	0	0	0	0
1,000 m3, 1,045	1,000 mt, 1,043	<u>ହ</u> ି	7,043	2,468	1.797	4,214	14,833	12,617	38,302	73,347	87,502	37,616	16,846	10,650
10 0.06 0.0 0 0 0 0 0 0 0 0	10 0 0 0 0 0 0 0 0 0	nold, reservoir (1,000 m3)	7,04	2,468	1.797	4,2,4	14,833	12,617	38,302	73,347	87,502	37,616	16,845	10.650
10 0 0 0 0 0 0 0 0 0	10 0 0 0 0 0 0 0 0 0		0	0	0	0	0	0	0	0	0	0	0	0
10	10		0	. 0	0	٥	٥	0	0	0	0	0	0	0
10 10 10 10 10 10 10 10	10 10 10 10 10 10 10 10												-	
1,000	10	(sec.)	:			-				•			:	
10	10	ea (km2)	80	0.03	800	90.0	90:0	800	8	0.00	900	8	90'0	90.0
Nom3) 2293 3.451 3.162 451 22 18 19 93 18 2.308 1,599 Nom3) 4607 60 0	Nom3) 2.293 3.451 3,162 451 22 18 19 93 18 2.308 1,599 Nom3) 4607 60 0	O m3)	2	E1	16	23	7	2	Π.	٥	2	11	덖	11
Color Colo	Color Colo	(1,000 m3)	2,293	3,551	3,162	451	ß	87	61	83	92	2.308	8	E
4,607 600 814 12,195 28,131 38,531 77,268 82,104 83,317 49,435 21,291 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	### 4,607 690 814 12,195 28,131 38,531 77,268 82,104 85,317 49,435 21,291 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	ge (1,000 m3)	0	0	0	0	•	0	Ö	0	0	0	C	9 0
reservoir (1,000 m.); 4,607 690 814 12,195 28,131 77,268 82,104 83,37 49,435 21,291 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Profession (1,000 m3): 4,607 690 814 12,195 28,131 38,531 77,288 82,104 83,317 49,435 21,291 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Ŷ	4 607	069	814	12,195	28,131	38.531	77.268	82 104	83 317	40.435	2 20	17.71
10 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	10 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	nold, reservoir (1,000 m3)	4.607	069	814	12,195	28,131	38,531	77.268	82.10	83.317	49 435	21.701	12.712
100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	10 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.		0	٥	0	0	0	0	•	0	0	0	C	10
1006 0.06 0.06 0.06 0.06 0.06 0.06 0.06	1006 0.006 0		0	c	0	0	0	Ö	0		0	• 0	• •	, 0
0 m ³) 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.0	10													
100 m3)	(1,000 m²)	sec.)	X	Š	4	*	~	č		è		4	•	
(1,000 m3)	(1,000 m3)	(Am)2)	3 5	3 :	3 3	3 1	8 :	80.5	§ :	§ '	8 :	90:0	8	80.0
1,000 m3)	1,000 m3)	(1 000 L)	2 6	2 6	2 4	3 6	4 ;	2 !	= :	Э	으	===	12	11
1986 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1986 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(cup 000 tr)	CKG.4	5.55 5.	ê	087.1	77	× ·	<u>2</u>) '	ğ,	3	1.623	1.886	983
1986 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1986 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	r. (towards)		> ;	٠	3	O !	>	0	0	0	0	0	0
1986 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1986 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	()-	3.	810.7	890.	3.421	14,027	4.394	8	54.589	60,919	43,133	19.679	11,627
1988 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1986 1987 1988 1988 1988 1989 1990 1990 1990 1990	icia, reservoir (1,000 ms)	9,	210.7	š.	1,4,	14,027	14,394	3.18	54,589	8	43,133	19.679	11,627
1986 1987 1988 1988 1989 1990	1986 1987 1988 1989 1990		> •	٠ خ	⇒	0	•	0	0	0	0	0	0	0
1986 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1988 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		0	o .	0	0	•	0	0	•	0	0	0	0
1986 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1986 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	á												
			•	•			٠,							
		9861	> (> •	>	5	S	9	0	0	0	0	0	0
		1861	o (د د	O 4	φ,	0	0	0	Ö	0	0	0	0
		1988	o,	>	0	0	o ·	0	0	0	0	٥	0	٥
		1989	0	: •		0	0	0	0	0	0	Ö	0	0
		066:	Ö	•	0	0	•	0	Ö	0	0	0	0	Ó
		1861	o	Ö	0	0	0	٥	0	0	0	0	0	٥
		1992	0	0	œ [']	o	0	٥	0	٥	0	0	٥	0
		1993	0	0	0	0	0	0	0	0	0	Ċ	c	•
		1994	C	¢	0	c	c	c	•	• •	• •	•	s 'c	•
		9001	• •	> <	,	•	> <	> <	> <	.	> (> •	Ġ.	٥
		1995	0	0	0	Ó	0	0	٥	٥	0	0	•	0
									-					
					v									

Table IV. 10 Water Balance Calculation (Upper Tay-Un Scheme)

Tay-Un Scheme

Runoff ((m3/sec)		:									
				Apr. May		Jol.	Aug.					
***	31	29	31	ጸ		ള	31	33	ጽ	E.	S	31
Runoff 1986	0.41	032	57	0.24	99.0	8	<u>1</u>	8.	8	 \$	8.	\$. \$
	0.41	S	0.25	0.31	0.48	68.0	3	2.01	2.02	54.1	0.81	0.46
1988	0.38	0.33	0.27	0.37	0.60	13	8	1.65	1.35	1.24	0.79	0.42
6861	0.32	0.24	0.18	0.21	1,	1.16	1 14	8	4	113	69:0	0.39
0661	0.29	6.21	0.18	0.15	0.37	30	0.97	1.24	1.70	1.47	0.86	0.41
1661	0.32	0.23	0,30	0.31	0.28	050	0.75	1.33	. .	53	86.0	0.70
1992	0.39	0.31	0.26	0.23	0.31	0.49	0.81	1.19	, 34 45	1.15	69.0	0.42
1993	030	0.23	0.18	0.16	0.27	0.52	990	0.82	1,29	1.14	0.82	090
19061	0.20	0.21	0.15	0.14	ដូ	0.56	86.0	131	4.	1.12	0.51	0.31
\$661	2	0.15	80	0.05	92.0	0.42	0.81	0.83	0.87	\$9.0	0.31	0.17
							• ,					
Irrigation Dc	0.13	0.22	0.20	8	8	0.00	000	800	9 0	0.13	070	8
	0.13	0.24	정	0.03	8	8	8	800	80:0	0.17	520	90.0
1988	0.12	0.16	0.24	0.02	80	800	0.0	000	80.0	0.07	0.23	90.0
6861	0.13	0.24	0.20	0.05	000	800	000	80	0.0	0.18	0.16	90.0
0661	0.13	0.24	0.20	0.08	80	800	8	800	800	0.13	070	90.0
1661	0.13	0.11	90.0	0.10	800	800	8	000	0.23	8	000	0.02
1992	0.10	0.19	0.15	800	8	8	0.0	800	0.0	0,25	800	0.02
2001	0.12	0.20	0.17	0.05	80	000	8	000	0.0	0.12	800	0.01
7661	0.13	0.24	0.20	0.08	80	000	00.0	800	800	0.33	\$20	0.05
1995	0.13	0.24	0.26	0.08	000	8.0	0.0	0.13	0.21	0.28	0.23	0.04
						:						
*** Domestic Water Demand (m3/sec.)	0.00	0.00	0.00	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
1986 Water Loss (m3/sec.)											:	
Surface water area (km2)	0.08	90.0	8	900	8	900	8	90.0	900	90.0	900	8
Potential ET (mm)	145	181	219	208	8	141	147	128	9	85. 80.	162	151
••• Water loss (1,000 m3)	<u>o</u>	13	9	23	4	9	=	Φ.	으	=	23	
Total of outflow (1,000 m3)	374	558	<u>%</u>	175	1	ដ	ដ	ដ	91	ž	3	8
Reservoir Storage (1,000 m3)	8	g	8	8	8	8	8	8	8	8	8	82
Water Balance (I-O)	912	4)4	318	\$45	1,791	2,671	4,038	5,436	5,427	3,755	2,221	1,503
Water Balance incld. reservoir (1,000 m3;	912	4.4	318	Ą.	1,791	2,671	4,038	5.436	5,427	3,755	2,221	1,503
	8	8	200	8	8	8	8	8	8	8	80 70	28
Required Reservoir Capacity (1,000 m3)	200											,
Deficit ****	0		0	0	0	0	0	•	0	0	0	0
1987 Water Loss (m7/sec.)					:							
Surface want arts (km2)	900	900	800	800	900	800	900	900	800	800	80	90.0
Water loss (1,000 m3)	22	<u> </u>	91	2	14	ខ្ព	П	Ġ	2	.11	ဌ	11
Total of outflow (1,000 m3)	374	\$85	618	ই	11	13	=	1	8	472	658	167
Reservoir Storage (1,000 m3)	200	8	8	8	8	8	8	8	8	8	88	500
	912	383	24.	\$	1,461	2,499	4,548	5,584	5,223	3,638	1,653	1,278
Water Balance incld. reservoir (1,000 m3)	912	383	244	ş	1.461	2,488	4,548	5,584	5,223	3.638	1,653	1,278
	82	200	82	8	8	8	8	8	8	8	8	500
Deficie ****	•	0	0	0	0	0	0	0	٥	0	0	0
1956 Water Loss (novect.) Surface water area (km.2)	900	900	900	800	80	800	8	900	90:0	80.0	800	80.0
Water loss (1,000 m3)	2	<u>≅</u> ∷	92	23	7	2	=	6	ន	=	2	Ξ
J. MILL AND A PROPERTY OF THE PARTY OF		;										

										•	:	
Total of outflow (1,000 m3)	3	705	3	. 23	-	<u></u>	Ξ	7	2	20	613	10.
Reservoir Morage (1,000 m3)	8	8	8	28	8	8	8	8	8	8	8	8
Water Balance (I-O)	2,4	25	3	1.085	£ i	2.954	2.651	4.617	3,528	3,337	1.634	1,146
water Balance incld, reservoir (1,000 m3)	2 8	25.5	3 8	1,085	6/1/3	2,92 4, 8	2.651	4,617	3,528	3,337	1.634	3.5
	3	3	3	3	3	8	3	8	8	8	ន្ត	8
Deficit	•	0	0	0	٥,	Ó	0	0	•	0	0	0
1989 Water I ass (m3/cm)		:			٠	:				-		
	~	***	~	č	~	. 00	Ž	è	. 5	5 (è	è
Surface water area (kmz)	3 :	8 :	8	3	900	3	8	8	3	§	8	8
Water loss (1,000 m3)	2	:3	9:	15	7	ន	=	Φ.	음	Ξ	ដ	겳
Total of outflow (1,000 m3)	357	585	፠	S	13	S	13	2	n	485	437	2
Reservoir Storage (1,000 m3)	8	8	198	126	8	8	8	8	ğ	8	8	8
Water Balance (I-O)	703	861	126	119	2,108	3,187	3,252	4,464	3,830	2,738	3	1.088
Water Balance incld. reservoir (1,000 m3;	703	198	126	611	2,108	3,187	3,252	404,4	3,830	2,738	1.55	1.088
	8	861	126	200	8	92	82	8	8	8	8	8
Deficir	0	0	0	0	٥	0	0	0	0	0	0	0
								-				
1990 Water Loss (ni2/sec.)		. :										
Surface water area (km2)	90.0	900	\$	90.0	900	8	900	900	900	900	000	90.0
Water loss (1,000 m3)	ន	13	9	.:	7	2	11	ø	2	11	77	11
Total of outflow (1.000 m3)	374	283	*	214	17	13	=	23	£1	374	94	167
Reservoir Storage (1,000 m3)	200	200	131	\$	300	200	, S	Ş	8	٤	٤	٤
Water Balance (I-O)	3	} <u>F</u>	\$ \$, 45	127	272	200	3 3	3 5	3 5	3 6	3 5
Water Defende and demonstrated and	3 3	3 5	; ;	3 6	****	1 2			100	101.0	160'1	1,120
water basance inclusives the Cityon included	8 8	7	3 :	or,	*/!'!	1 5	2,783	3	1903	5.(5)	1,85	27.
	3	<u>.</u>	77	3	25	9	8	8	8	g	8	8
Deficit ****	>	>	0	0	0	0	0	0	0	0	0	0
				ż								١.
1991 Water Loss (m.//soc.)	;	;	•								:	
Surface water area (km2)	8	8	8	8	8	8	8	8	900	8	8	90.0
Water loss (1,000 m3)	2	23	22	Ŋ	4	2	:	o .	2	=	ဌ	=
Total of ourflow (1,000 m3)	329	Š	ដូ	283	11	ន	ដ	ဌ	\$	174	7	'n
Reservoir Storage (1,000 m3)	8	8	8	200	8	g	န္တ	န္က	8	န္တ	ន្ត	8
Water Balance (I-Q)	710	ន្ល	782	8	ŧ	1.483	2,205	3,737	3,215	3,477	2,719	2,013
Water Balance incld, reservoir (1,000 m3)	710	ន្ត	782	33	ŧ	1,483	2205	3,737	3,215	3.477	2,719	2,013
-	8	8	8	8	8	8	8	8	8	82	38	8
Deficit ****	0	Ó	0	٥	0	٥	0	0	0	0	0	0
1992 Water Loss (m3/sec.)					;							
Surface water area (km2)	90:0	90:0	90.0	800	900	800	8	800	800	800	900	900
Water loss (1,000 m3)	2	11	91	11	7	임	Ξ	6	2	11	검	П
Total of outflow (1,000 m3)	25	487	429	17.	1.1	IJ	195	업	£	\$69	- 23	3
Reservoir Storage (1,000 m3)	8	8	200	200	8	8	92	8	8	ă	8	ş
Water Balance (I-O)	956	. 473	462	615	1,014	1,445	2,162	3,374	3,598	2.574	1.978	1,255
Water Balance incld, reservoir (1,000 m3)	8	173	462	615	1.01	3,445	2,162	3,374	3,5%	2,574	1,978	1.255
	8	8	g	38	8	200	ş	200	200	200	200	92
Deficit ***	٥	0	0	0	0	0	Ö	٥	0	0	0	0
1993 Water Loss (mYsec.)								٠				
Surface water area (km2)	80	800	900	8	900	8	8	900	80	900	90:0	90:0
Water loss (1,000 m3)	2	ដ	\$	23	4	9	11	٥	9	11	덢	11

444. 913 1,532 1,833 2,387 3,443 2,925 2,303 1,778 200 200 200 200 200 200 200 200 0.0 0 0 0 0 0 0 0 0 0.0 0 0 0 0 0 0 0 0 1.6 0.0 0 0 0 0 0 0 0 1.5 1.7 1.1 1.1 1.2 1.7 90 6.0 0
913 1532 1535 2387 3543 2925 2303 1778 200
200 200
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0.06 0.06 <td< td=""></td<>
14 10 11 9 10 11 12 11 13 13 13 13 13
17 13 13 12 173 999 650 151 145 200 200 200 200 200 200 200 748 1,639 2,820 3,700 3,821 2,291 873 884 748 1,639 2,820 3,700 3,821 2,291 873 884 200 <td< td=""></td<>
152 200 200 200 200 200 200 200 200 200 2
748 1,639 2,820 3,700 3,821 2,291 873 884 748 1,639 2,820 3,700 3,821 2,291 873 884 200 200 200 200 200 200 200 200 0 0 0 0
748 1,639 2,820 3,700 3,821 2,791 873 884 200 200 200 200 200 200 200 200 0 0 0 0
200 200
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
14
17 13 13 358 563 769 613 122 0 200 200 200 200 200 200 667 1,264 2,350 2,069 1,900 1,167 388 544 200 200 200 200 200 200 200 0 0 0 0 0 0
0 200 200 200 200 200 200 200 200 200 2
667 1,264 2,350 2,089 1,900 1,167 388 544 667 1,264 2,350 2,089 1,900 1,167 388 544 200 200 200 200 200 200 200 0 0 0 0 0 0
67 1,264 2,350 2,069 1,900 1,167 388 544 200 200 200 200 200 200 200 0 0 0 0 0 0
200 200 200 200 200 200 200 200 200 200

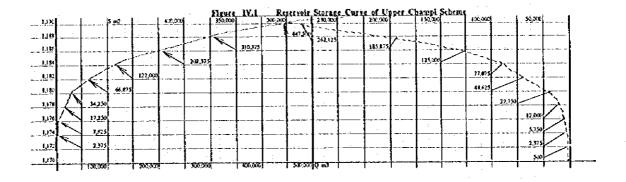
Table IV.11 Salient Features of Upper Champi, Upper Tapoung and Upper Kapheu Schemes

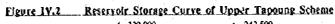
Upper Champi Scheme	General Description	
Scheme Name	Upper Champi	-
Location and Altitude	Pakxong District, Champasak Province (EL 900 to 1,200 m)	
No. of Target Villages	8 villages	
Village Name	Lak33, Lak35, Lak36, Lak38, Lak40, Lak42, Lak43, Lak45	
Households	828 households	
Population	4,731	
rrigation and Drainage Facilities		
- Water sources	H.Champi	
- Proposed cropping pattern and Irrigation area (net)		730 ha
- Diversion weir	Concrete diversion weir, Width = 43.0 m	1 place
- Earthfill dam	V = 34,000 m3	l no.
- Reservoir	Effective storage capacity = 105,000 m3	t iros
- Design discharge	Elistare storage taletty = 105,000 ms	0.117 m3/sec.
- Maia irrigation canals	Concrete lining canal, 2 canals	4.7 km
- Secondary irrigation canals	Concrete lining canal, 3 canals	13.0 km
- Secondary drainage canals	Earth canal, 8 canals	304m
• Farm road	Effective width = 3.0m, Gravet pavement	21.2 km
- Farm ponds	Cut and embankment pond	43 piaces
pper Tapoung Scheme		
pper suposuag ocucae	General Description	
Scheme Name	Upper Tapoung	· · · · · · · · · · · · · · · · · · ·
Location and Akitude	Pakxong District, Champasak Province (EL 900 to 1,300 m)	
No. of Target Villages Village Name	3 villages Phoulangkeo, Houaisan, Xetapung	
Households	262 households	
Population	1,478	
rrigation and Drainage Facilities • Water sources	II manage	
 Proposed cropping pattern and Irrigation area (net) 	H. Tapoung Upland Crop - Vegetable: 80 ha	80 ha
- Diversion weir	Concrete diversion weir. Width = 38.0 m	1 place
- Reservoir	Effective storage capacity = 240,000 m3	
Design discharge Main irrigation canals	Consessed listen most 1 annal	0.063 m3/sec.
- Secondary irrigation canals	Concrete lining canal, I canal Concrete lining canal, I canal	1.6 km 0.8 km
Secondary drainage canals	Earth canal, I canal	0.2 km
- Farm roads	Effective width = 3.0m, Gravel pavement	5.3 km
- Parm ponds	Cut and embankment pond	5 places
		•
pper Kapheu Scheme	· · · · · · · · · · · · · · · · · · ·	
	General Description	
Scheme Name	Upper Kapheu	
Location and Altitude No. of Target Villages	Laongam District, Salavan Province (EL 600 to 800m) 5 villages	
Village Name	Phouak-nol, Sixiangmai, On-nol, Phouak-gnai, On-gnai	
Households	456 households	
Population	2,393	
rrigation and Drainage Facilities - Water sources	H.Kapheu	· · · · · · · · · · · · · · · · · · ·
 Proposed cropping pattern and Irrigation area (net) 	Coffee: 900 ha, Paddy - Upland Crops: 100 ha	1,000 ha
- Diversion weir	Concrete diversion weir. Width = 14.0 m	1 place
- Earthfill dam - Reservoir	V1 = 20,000 m, $V2 = 16,000 m$, $V3 = 18,000 m$, $V4 = 18,000 m$	4 nos.
*15 991 1 635	Dam No.1: Effective storage capacity = 137,000 m3 Dam No.2: Effective storage capacity = 64,000 m3	
	Dam No.3: Effective storage capacity = 52,000 m3	
m	Dam No.4: Effective storage capacity = 142,000 m3	
- Design discharge Main industries canals	Consists Pales and Assess.	0.272 m3/sec.
 Main irrigation canals Secondary irrigation canals 	Concrete lining canal, 2 canals Concrete lining canal, 3 canals	2.2 km
- Secondary drainage canals	Earth canal, 6 canals	11.8 km 1.1 km
Farm roads	Effective width = 3.0m, Gravel pavement	15.3 km
 Farm roads 	Out and embankment pond	35 places

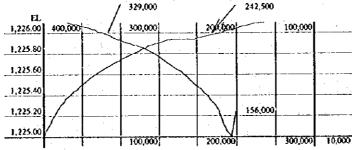
Table IV.12 Salient Features of the Lower Xe Set and Upper Tay - Un Schemes

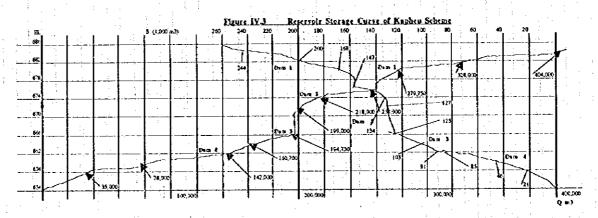
	General Description	
Scheme Name	Lower Xe Set	
Location and Altitude	Salavan District, Salavan Province (EL 300 to 400m)	
No, of Target Villages	6 villages	
Village Name	Natteu, Sengvang-gnai, Houakhowa, Sengvang-noi, Ki	tonleng, Natou
Households	386 households	
Population	2,309	
Irrigation and Drainage Facilities		
- Water sources	H.Xe Set	
- Proposed cropping pattern and Irrigation area (net)	Paddy - Paddy: 200 ha, Paddy - Upland Crops: 800 ha	1,000 ha
- Diversion Weir	Concrete diversion weir, Width = 75.0 m	I place
- Regulation pond		1 place
- Design discharge		9.030 m3/sec.
- Main Irrigation canals	Concrete lining canal, 3 canals	3.6 km
- Secondary irrigation canals	Concrete lining canal, 5 canals	11.0 km
- Secondary drainage canals	Earth canal, 4 canals	7.6 km
- Farm roads	Effective width = 3.0 m, Gravel pavement	26.0 km
- Farm ponds	Cut and embankment pood	35 places
oper Tay - Un Scheme	Caparal Recordation	
per Tay - Un Scheme Scheme Name	General Description Upper Fay-Un	
	Upper Tay-Un Thateng District, Sekong Province (EL 500 to 600m)	
Scheme Name	Upper Fay-Un Thateng District, Sekong Province (EL 500 to 600m) 3 villages	
Scheme Name Location and Akitude	Upper Fay-tin Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlit, Khanikok, Chakam-mai	
Scheme Name Location and Akitude No. of Target Villages	Upper Fay-Un Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlit, Khanikok, Chakam-mai 108 households	
Scheme Name Location and Akitude No. of Target Villages Village Name	Upper Fay-tin Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlit, Khanikok, Chakam-mai	
Scheme Name Location and Akitude No. of Target Villages Village Name Households Population igation and Drainage Facilities	Upper Fay-t'n Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlit, Khamkok, Chakam-mai 103 households 871	
Scheme Name Location and Akitude No. of Target Villages Village Name Households Population	Upper Fay-Un Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlin, Khamkok, Chakam-mai 103 households 871 H.Tay-un, and H.Thon Paddy - Paddy - Paddy - Upland Crops: 80 ha	
Scheme Name Location and Akitude No. of Target Villages Village Name Households Population igation and Drainage Facilities - Water sources - Proposed cropping pattern and Irrigation area (net)	Upper Fay-Un Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlit, Khamkok, Chakam-mai 103 households 871 H.Tay-un, and H.Thon Paddy - Paddy : 70 ha, Paddy - Upland Crops : 80 ha Rainy Season Paddy : 180 ha	330 ha
Scheme Name Location and Aktitude No. of Target Villages Village Name Households Population igation and Drainage Facilities - Water sources	Upper Fay-Un Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlit, Khamkok, Chakam-mai 103 households 871 H.Tay-un, and H.Thon Paddy - Paddy : 70 ha, Paddy - Upland Crops : 80 ha Rainy Season Paddy : 180 ha H.Tay-Un, Dam No.1 Earthfill dam	I place
Scheme Name Location and Akitude No. of Target Villages Village Name Households Population igation and Drainage Facilities - Water sources - Proposed cropping pattern and Irrigation area (net)	Upper Fay-t'n Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlin, Khamkok, Chakam-mai 103 households 871 H.Tay-un, and H.Thon Paddy - Paddy : 70 ha, Paddy - Upland Crops : 80 ha Rainy Season Paddy : 180 ha H.Tay-un, Dam No.1 Earthfill dam H.Thon, Dam No.2 Earthfill dam Dam No.3 Earthfill dam	l place 1 place 1 place
Scheme Name Location and Akitude No. of Target Villages Village Name Households Population igation and Drainage Facilities - Water sources - Proposed cropping pattern and Irrigation area (net)	Upper Fay-t'n Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlin, Khamkok, Chakam-mai 103 households 871 H.Tay-un, and H.Thon Paddy - Paddy : 70 ha, Paddy - Upland Crops : 80 ha Rainy Season Paddy : 180 ha H.Tay-Un, Dam No.1 Earthfill dam H.Thon, Dam No.2 Earthfill dam Dam No.3 Earthfill dam VI = 21,000 m3, V2 = 49,000 m3, V3 = 10,000 m3	l place l place
Scheme Name Location and Aktitude No. of Target Villages Village Name Households Population igation and Drainage Facilities - Water sources - Proposed ecopping pattern and Irrigation area (net) - Diversion weir	Upper Fay-Un Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlit, Khamkok, Chakam-mai 103 households 871 H.Tay-un, and H.Thon Paddy - Paddy : 70 ha, Paddy - Upland Crops : 80 ha Rainy Season Paddy : 180 ha H.Tay-Un, Dam No.1 Earthfill dam H.Thon, Dam No.2 Earthfill dam Dam No.3 Earthfill dam V1 = 21,000 m3, V2 = 49,000 m3, V3 = 10,000 m3 Effective storage capacity = - m3	l place 1 place 1 place
Scheme Name Location and Akitude No. of Target Villages Village Name Households Population igation and Drainage Facilities - Water sources - Proposed cropping pattern and Irrigation area (net) - Diversion weir - Earthfilt dam	Upper Fay-Un Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlit, Khamkok, Chakam-mai 103 households 871 H.Tay-un, and H.Thon Paddy - Paddy : 70 ha, Paddy - Upland Crops : 80 ha Rainy Season Paddy : 180 ha H.Tay-Un, Dam No.1 Earthfill dam H.Thon, Dam No.2 Earthfill dam Dam No.3 Earthfill dam V1 = 21,000 m3, V2 = 49,000 m3, V3 = 10,000 m3 Effective storage capacity = - m3 Effective storage capacity = 158,000 m3	l place 1 place 1 place
Scheme Name Location and Aktitude No. of Target Villages Village Name Households Population igation and Drainage Facilities - Water sources - Proposed cropping pattern and Irrigation area (net) - Diversion weir - Earthfill dam - Reservoir	Upper Fay-Un Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlit, Khamkok, Chakam-mai 103 households 871 H.Tay-un, and H.Thon Paddy - Paddy : 70 ha, Paddy - Upland Crops : 80 ha Rainy Season Paddy : 180 ha H.Tay-Un, Dam No.1 Earthfill dam H.Thon, Dam No.2 Earthfill dam Dam No.3 Earthfill dam V1 = 21,000 m3, V2 = 49,000 m3, V3 = 10,000 m3 Effective storage capacity = - m3	l place 1 place 1 place
Scheme Name Location and Aktitude No. of Target Villages Village Name Households Population igation and Drainage Facilities - Water sources - Proposed cropping pattern and Irrigation area (net) - Diversion weir - Earthfill dam	Upper Fay-Un Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlit, Khamkok, Chakam-mai 103 households 871 H.Tay-un, and H.Thon Paddy - Paddy : 70 ha, Paddy - Upland Crops : 80 ha Rainy Season Paddy : 180 ha H.Tay-Un, Dam No.1 Earthfill dam H.Thon, Dam No.2 Earthfill dam Dam No.3 Earthfill dam V1 = 21,000 m3, V2 = 49,000 m3, V3 = 10,000 m3 Effective storage capacity = - m3 Effective storage capacity = 158,000 m3	I place I place I place I place I place I place O.489 m3/sec.
Scheme Name Location and Akitude No. of Target Villages Village Name Households Population igation and Drainage Facilities - Water sources - Proposed cropping pattern and Irrigation area (net) - Diversion weir - Earthfilt dam - Reservoir Regulation pond - Design discharge	Upper Fay-Un Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlit, Khamkok, Chakam-mai 103 households 871 H.Tay-un, and H.Thon Paddy - Paddy : 70 ha, Paddy - Upland Crops : 80 ha Rainy Season Paddy : 180 ha H.Tay-Un, Dam No.1 Earthfill dam H.Thon, Dam No.2 Earthfill dam Dam No.3 Earthfill dam V1 = 21,000 m3, V2 = 49,000 m3, V3 = 10,000 m3 Effective storage capacity = - m3 Effective storage capacity = 158,000 m3 Effective storage capacity = 65,000 m3 Dam No.1 Dam No.1	1 place 1 place 1 place 3 nos. 1 place 0.489 m3/sec. 0.382 m3/sec.
Scheme Name Location and Aktitude No. of Target Villages Village Name Households Population figation and Drainage Facilities - Water sources - Proposed cropping pattern and Irrigation area (net) - Diversion weir - Earthfill dam - Reservoir - Regulation pond - Design discharge - Main irrigation canals	Upper Fay-Un Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlit, Khantkok, Chakam-mai 103 households 871 H.Tay-un, and H.Thon Paddy - Paddy : 70 ha, Paddy - Upland Crops : 80 ha Reiny Season Paddy : 180 ha H.Tay-Un, Dam No.1 Earthfill dam H.Thon, Dam No.2 Earthfill dam Dam No.3 Earthfill dam V1 = 21,000 m3, V2 = 49,000 m3, V3 = 10,000 m3 Effective storage capacity = - m3 Effective storage capacity = 158,000 m3 Effective storage capacity = 65,000 m3 Dam No.1 Dam No.1 Dam No.2 Concrete lining canal, 2 canals	1 place 1 place 1 place 3 nos. 1 place 0.489 m3/sec. 0.382 m3/sec. 2.5 km
Location and Akitude No. of Target Villages Village Name Households Population rigation and Drainage Facilities - Water sources - Proposed cropping pattern and Irrigation area (net) - Diversion weit - Earthfill dam - Reservoir Regulation pond - Design discharge	Upper Fay-Un Thateng District, Sekong Province (EL 500 to 600m) 3 villages Chakamlit, Khamkok, Chakam-mai 103 households 871 H.Tay-un, and H.Thon Paddy - Paddy : 70 ha, Paddy - Upland Crops : 80 ha Rainy Season Paddy : 180 ha H.Tay-Un, Dam No.1 Earthfill dam H.Thon, Dam No.2 Earthfill dam Dam No.3 Earthfill dam V1 = 21,000 m3, V2 = 49,000 m3, V3 = 10,000 m3 Effective storage capacity = - m3 Effective storage capacity = 158,000 m3 Effective storage capacity = 65,000 m3 Dam No.1 Dam No.1	1 place 1 place 1 place 3 nos. 1 place 0.489 m3/sec. 0.382 m3/sec.

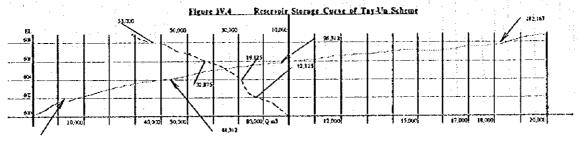
Figures

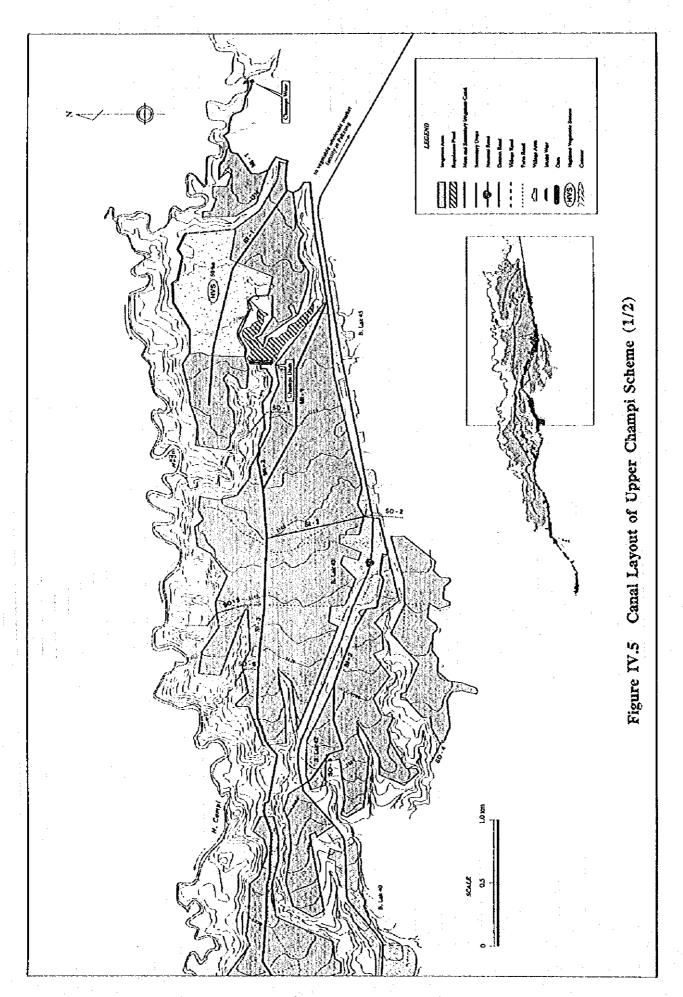


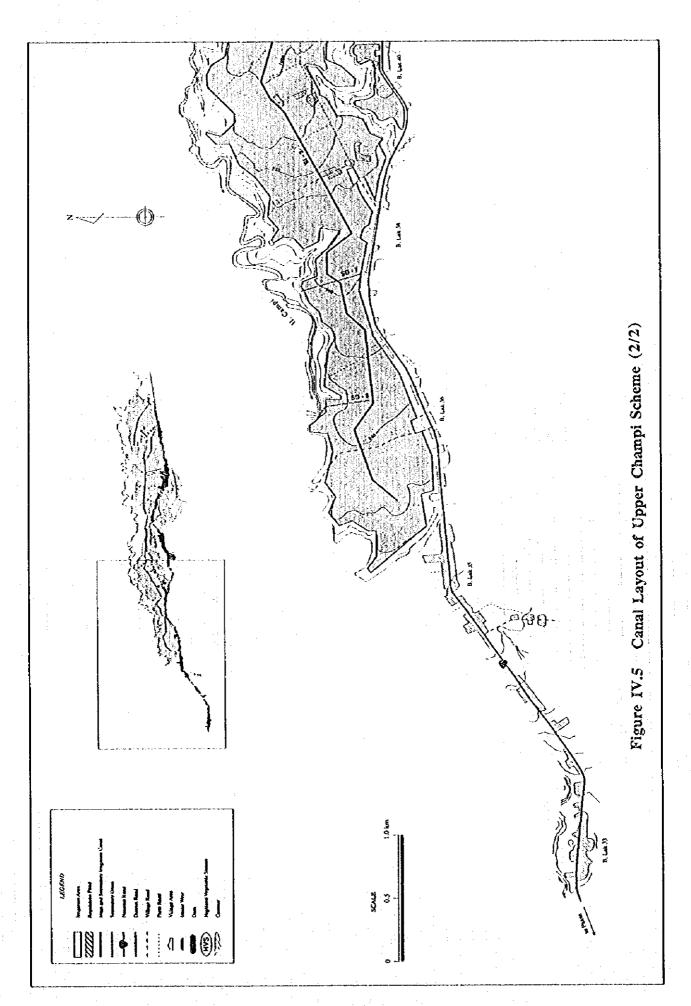


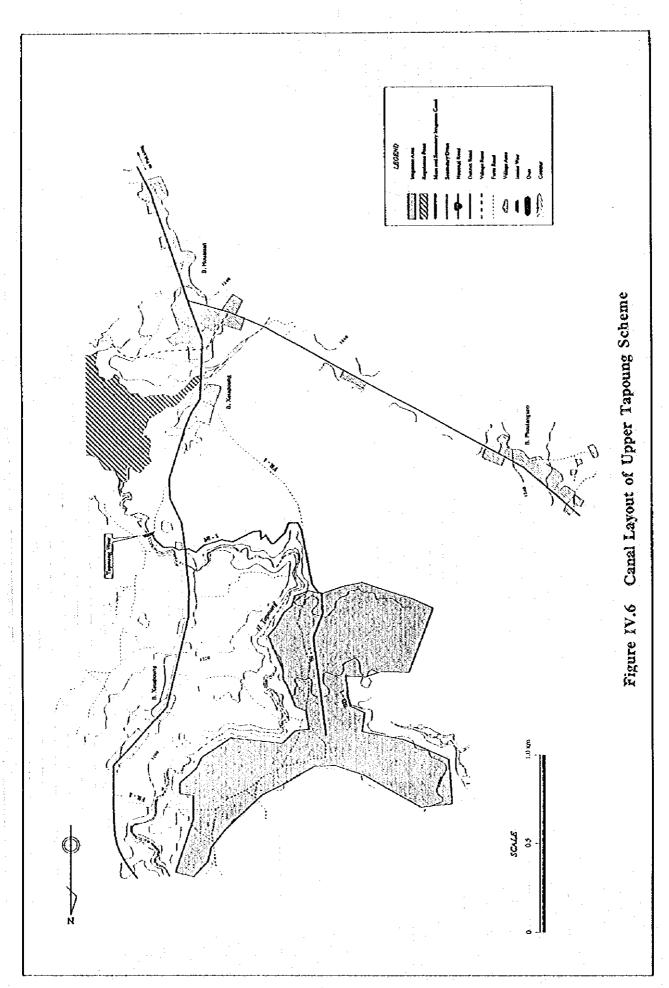


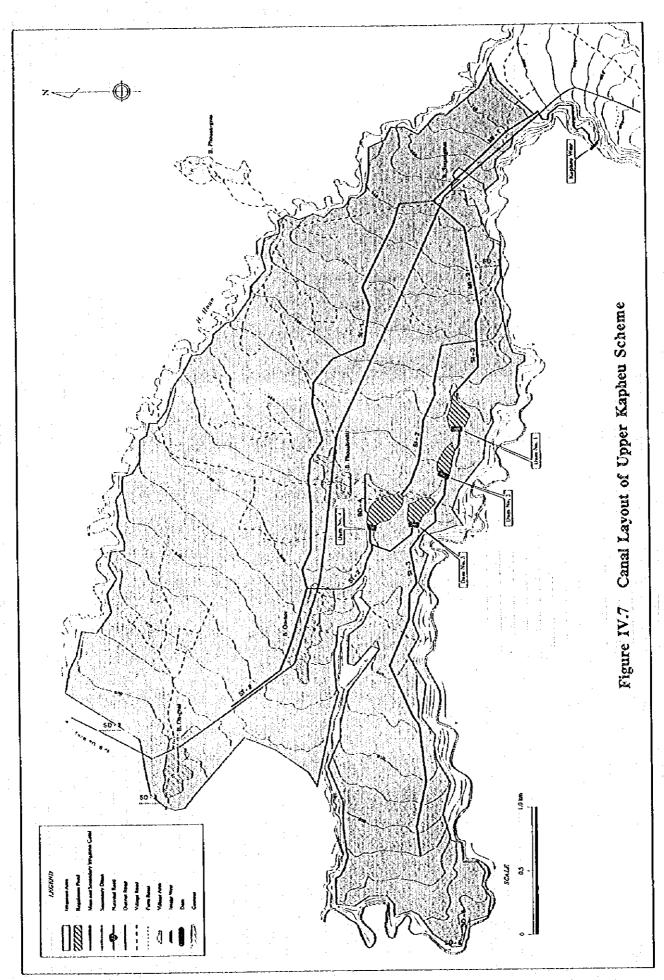




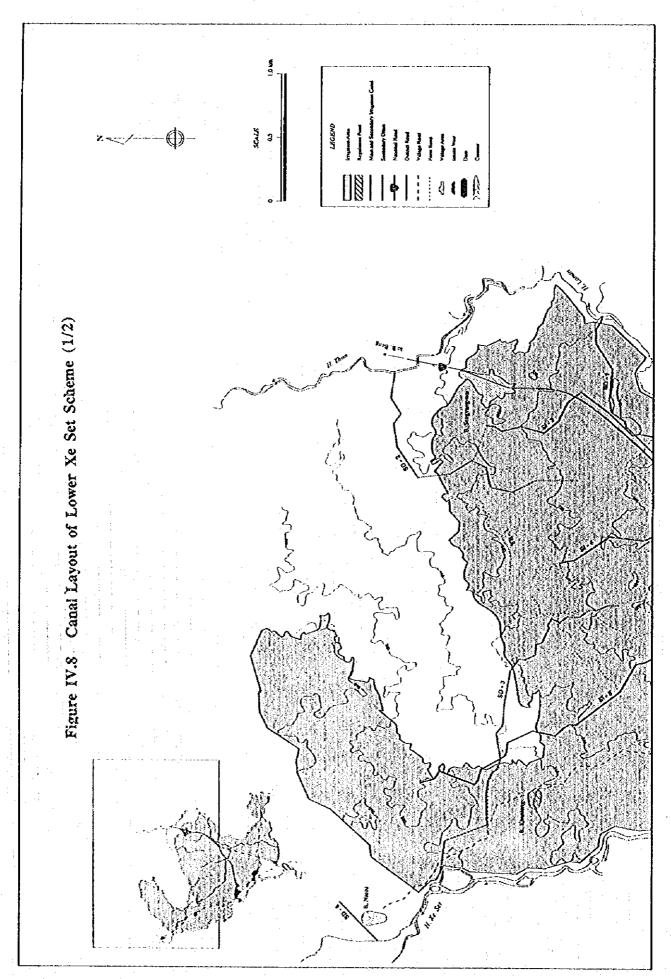








IV-F- 5



IV-P- 6