




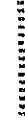



No. 10 Ku Cham Pumping Irrigation System

LEGEND

-  Main Canal
-  Lateral Canal
-  Drainage Canal
-  Diversion Point
-  Pumping Station
-  Delivery Pipe
-  Irrigable Area

0 0.5 1.0 1.5 2.0 km

APPENDIX X. PROJECT COST

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Table X-1 Cost Estimate for Civil Work of Tidal Regulators

Description	Unit	Quantity	Total (P)		Local (P)		Foreign (P)	
			Rate	Amount	Rate	Amount	Rate	Amount
<u>(A) Upper Tidal Regulator (UTR)</u>								
A.1 <u>Temporary Work</u>								
Site Clearing	Ha	5.7	10,000	57,000	1,130	6,441	8,870	50,559
Mobilization, Construction Equipment	L.S			798,700		239,610		559,090
Power Line	L.S			384,540		280,800		103,740
Coffer Dam for Regulator Body	cu.m	41,000		574,000	2	82,000	12	492,000
Access Road, Laterite Paving	cu.m	13,000	131	1,703,000	122	1,586,000	9	117,000
Mobilization, Dredger	L.S			2,767,308		18,333		2,748,975
Jetty Construction	L.S			883,300		607,542		275,758
Miscellaneous	L.S			72,152		28,394		43,758
Sub-total	L.S			<u>7,240,000</u>		<u>2,849,120</u>		<u>4,390,880</u>
A.2. <u>Regulator Body and Connection Channel</u>								
Caldron Excavation	cu.m	165,100	49	8,089,900	11	1,816,100	38	6,273,800
Fill by Caldron Excavation	cu.m	149,000	44	6,556,000	10	1,490,000	34	5,066,000
Connection Channel Excavation by Dredger	cu.m	360,000	53	19,080,000	1	360,000	52	18,720,000

Description	Unit	Quantity	Total (₪)		Local (₪)		Foreign (₪)	
			Rate	Amount	Rate	Amount	Rate	Amount
Connection Channel Excavation by Dragline	cu.m	13,000	42	546,000	2	26,000	40	520,000
Fill by Dragline Excavation	cu.m	11,700	14	163,800	2	23,400	12	140,400
RC Pile, 0.4x0.4x12m	P.C.S	484	11,400	5,517,600	3,848	1,862,432	7,552	3,655,168
RC Pile, 0.4x0.4x6m	P.C.S	210	5,650	1,186,500	1,930	405,300	3,720	781,200
Steel Sheet Pile	Ton	70	20,000	1,400,000	4,200	294,000	15,800	1,106,000
Lean Concrete	cu.m	580	1,550	899,000	940	545,200	610	353,800
RC for Structure, 220 kg/cm ²	cu.m	4,520	4,700	21,244,000	3,038	13,731,760	1,662	7,512,240
RC for Aprin, 180 kg/cm ²	cu.m	4,280	4,100	17,548,000	2,581	11,046,680	1,519	6,501,320
Bridge, PC Post- tension	sq.m	840	10,000	8,400,000	3,500	2,940,000	6,500	5,460,000
Riprap Pitching	cu.m	7,210	700	5,047,000	700	5,047,000	-	-
Gate Hoist House	No.	7	240,000	1,680,000	96,000	672,000	144,000	1,008,000
Miscellaneous	L.S.			972,200		402,029		570,171
Sub-total				<u>98,330,000</u>		<u>40,661,901</u>		<u>57,668,099</u>
A.3 Sapi Yo Closure Dam								
Stripping	cu.m	3,500	20	70,000	2	7,000	18	63,000
Riprap Dumping	cu.m	1,200	470	564,000	430	516,000	40	48,000
Riprap Pitching	cu.m	1,300	700	910,000	700	910,000	-	-
Borrow Area Excava- tion	cu.m	14,500	21	304,500	2	29,000	19	275,500

Description	Unit	Quantity	Total (₱)		Local (₱)		Foreign (₱)	
			Rate	Amount	Rate	Amount	Rate	Amount
Embankment	cu.m	13,000	46	598,000	5	65,000	41	533,000
Laterite Paving	cu.m	200	131	26,200	122	24,400	9	1,800
Miscellaneous	L.S			27,300		17,128		10,172
Sub-total				<u>2,500,000</u>		<u>1,568,528</u>		<u>931,472</u>
A.4 Bang Nara Closure								
<u>Dam</u>								
Stripping	cu.m	18,000	53	954,000	1	18,000	52	936,000
Riprap Dumping	cu.m	14,000	470	6,580,000	430	6,020,000	40	560,000
Riprap Pitching	cu.m	5,200	700	3,640,000	700	3,640,000	-	-
Embankment by Dredger	cu.m	75,000	53	3,975,000	1	75,000	52	3,900,000
Laterite Paving	cu.m	1,000	131	131,000	122	122,000	9	9,000
Miscellaneous	L.S			260,000		168,030		91,970
Sub-total				<u>15,540,000</u>		<u>10,043,030</u>		<u>5,496,970</u>
A.5 Road								
Stripping	cu.m	7,700	20	154,000	2	15,400	18	138,600
Borrow Area Excavation	cu.m	41,000	21	861,000	2	82,000	19	779,000
Embankment	cu.m	37,000	46	1,702,000	5	185,000	41	1,517,000
Laterite Paving	cu.m	2,800	131	366,800	122	341,600	9	25,200
Miscellaneous	L.S			26,200		5,300		20,900
Sub-total				<u>3,110,000</u>		<u>629,300</u>		<u>2,480,700</u>

Description	Unit	Quantity	Total (₪)		Local (₪)		Foreign (₪)	
			Rate	Amount	Rate	Amount	Rate	Amount
<u>A.6 O&M Facilities</u>								
Control Office Building	sq.m	212	9,000	1,908,000		954,000		954,000
Miscellaneous	L.S			22,000		11,000		11,000
Sub-total				<u>1,930,000</u>		<u>965,000</u>		<u>965,000</u>
Total (A.1 to A.6)				<u>128,650,000</u>		<u>56,716,879</u>		<u>71,933,121</u>

Description	Unit	Quantity	Total (B)		Local (B)		Foreign (B)	
			Rate	Amount	Rate	Amount	Rate	Amount
<u>(B) Lower Tidal Regulator(LTR)</u>								
<u>B.1 Temporary Work</u>								
Site Clearing	Ha	3.0	10,000	30,000	1,130	3,390	8,870	26,610
Mobilization, Construction Equipment	L.S			266,300		79,890		186,410
Power Line	L.S			252,470		149,760		102,710
Coffer Dam for Regulator Body	cu.m	15,000	14	210,000	2	30,000	12	180,000
Access Road, Laterite Paving	cu.m	6,000	131	786,000	122	732,000	9	54,000
Mobilization, Dredger	L.S			922,436		6,111		916,325
Jetty Construction	L.S			674,000		478,801		195,199
Miscellaneous	L.S			28,794		13,566		15,228
Sub-total				3,170,000		1,493,518		1,676,482
<u>B.2 Regulator Body and Connection Channel</u>								
Caldron Excavation	cu.m	61,000	49	2,989,000	11	671,000	38	2,318,000
Fill by Caldron Excavation	cu.m	55,000	44	2,420,000	10	550,000	34	1,870,000
Connection Channel Excavation by Dredger	cu.m	88,000	53	4,664,000	1	88,000	52	4,576,000
Connection Channel Excavation by Dragline	cu.m	12,000	42	504,000	2	24,000	40	480,000

Description	Unit	Quantity	Total (₪)		Local (₪)		Foreign (₪)	
			Rate	Amount	Rate	Amount	Rate	Amount
Fill by Dragline Excavation	cu.m	11,000	14	154,000	2	22,000	12	132,000
RC Pile, 0.4x0.4x 18 m	P.C.S	366	174,000	6,368,400	5,785	2,117,310	11,615	4,251,090
Steel Sheet Pile	Ton	18	20,000	360,000	4,200	75,600	15,800	284,400
Lean Concrete	cu.m	190	1,550	294,500	940	178,600	610	115,900
RC for Structure, 220 kg/cm ²	cu.m	1,720	4,700	8,084,000	3,038	5,225,360	1,662	2,858,640
RC for Apron, 180 kg/cm ²	cu.m	1,690	4,100	6,929,000	2,581	4,361,890	1,519	2,567,110
Bridge, PC Post- tension	sq.m	170	10,000	1,700,000	3,500	595,000	6,500	1,105,000
Riprap Pitching	cu.m	2,560	700	1,792,000	700	1,792,000	-	-
Gate Hoist House	No.	3	240,000	720,000	96,000	288,000	144,000	432,000
Miscellaneous	L.S			371,100		160,454		210,646
Sub-total				<u>37,350,000</u>		<u>16,149,214</u>		<u>21,200,786</u>
B.3 Bang Nara Closure Dam								
Stripping	cu.m	5,000	53	265,000	1	5,000	52	260,000
Riprap Dumping	cu.m	2,600	470	1,222,000	430	1,118,000	40	104,000
Riprap Pitching	cu.m	1,300	700	910,000	700	910,000	-	-
Embankment by Dredger	cu.m	16,000	53	848,000	1	16,000	52	832,000
Laterite Paving	cu.m	400	131	52,400	122	48,800	9	3,600
Miscellaneous	L.S			52,600		33,464		19,136
Sub-total				<u>3,350,000</u>		<u>2,131,264</u>		<u>1,218,736</u>

Description	Unit	Quantity	Total (B)		Local (B)		Foreign (B)	
			Rate	Amount	Rate	Amount	Rate	Amount
B.4 Road								
Stripping	cu.m	11,200	20	224,000	2	22,400	18	201,600
Borrow Area Excavation	cu.m	41,000	21	861,000	2	82,000	19	779,000
Embankment	cu.m	37,000	46	1,702,000	5	185,000	41	1,517,000
Laterite Paving	cu.m	5,400	131	707,400	122	658,800	9	48,600
Miscellaneous				35,600		9,660		25,940
Sub-total				<u>3,530,000</u>		<u>957,860</u>		<u>2,572,140</u>
B.5 O&M Facilities								
Control Office Building	sq.m	119	9,000	1,071,000		535,500		535,500
Residence	Unit	4	150,000	600,000		450,000		150,000
Garage and Warehouse	sq.m	60	700	42,000		32,000		10,000
Miscellaneous	L.S.			17,000		10,100		6,900
Sub-total				<u>1,730,000</u>		<u>1,027,600</u>		<u>702,400</u>
Total (B.1 to B.5)				<u>49,130,000</u>		<u>21,759,456</u>		<u>27,370,544</u>

Table X-2 Cost Estimate for Gate Work of Tidal Regulators(Unit = ₪x10⁶)

	L.C.	F.C.		Total	Total
		I.F.C.	D.F.C.		
A. <u>UTR (660 ton)</u>	<u>30.06</u>	<u>3.98</u>	<u>104.17</u>	<u>108.15</u>	<u>138.21</u>
1. <u>Manufacturing</u>	<u>-</u>	<u>-</u>	<u>93.72</u>	<u>93.72</u>	<u>93.72</u>
Direct Cost	<u>-</u>	<u>-</u>	<u>51.69</u>	<u>51.69</u>	<u>51.69</u>
Indirect & Overhead	<u>-</u>	<u>-</u>	<u>42.03</u>	<u>42.03</u>	<u>42.03</u>
2. <u>Transportation</u>	<u>0.34</u>	<u>0.80</u>	<u>4.49</u>	<u>5.29</u>	<u>5.63</u>
Ocean	<u>-</u>	<u>-</u>	<u>4.49</u>	<u>4.49</u>	<u>4.49</u>
Inland (BKK to Site)	<u>0.34</u>	<u>0.80</u>	<u>-</u>	<u>0.80</u>	<u>1.14</u>
3. <u>Installation</u>	<u>5.42</u>	<u>3.18</u>	<u>4.04</u>	<u>7.22</u>	<u>12.64</u>
Direct Cost	<u>4.11</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>4.11</u>
Indirect & Overhead	<u>1.32</u>	<u>3.18</u>	<u>-</u>	<u>3.18</u>	<u>4.50</u>
Supervision	<u>-</u>	<u>-</u>	<u>4.04</u>	<u>4.04</u>	<u>4.04</u>
4. <u>O & M Equipment*/</u>	<u>-</u>	<u>-</u>	<u>1.92</u>	<u>1.92</u>	<u>1.92</u>
5. <u>Tax and Duty</u>	<u>24.30</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>24.30</u>
B. <u>LTR (180 ton)</u>	<u>9.37</u>	<u>1.59</u>	<u>31.38</u>	<u>32.97</u>	<u>42.34</u>
1. <u>Manufacturing</u>	<u>-</u>	<u>-</u>	<u>27.17</u>	<u>27.17</u>	<u>27.17</u>
Direct Cost	<u>-</u>	<u>-</u>	<u>16.94</u>	<u>16.94</u>	<u>16.94</u>
Indirect & Overhead	<u>-</u>	<u>-</u>	<u>10.23</u>	<u>10.23</u>	<u>10.23</u>
2. <u>Transportation</u>	<u>0.12</u>	<u>0.29</u>	<u>1.59</u>	<u>1.88</u>	<u>2.00</u>
Ocean	<u>-</u>	<u>-</u>	<u>1.59</u>	<u>1.59</u>	<u>1.59</u>
Inland (BKK to Site)	<u>0.12</u>	<u>0.29</u>	<u>-</u>	<u>0.29</u>	<u>0.41</u>
3. <u>Installation</u>	<u>1.81</u>	<u>1.30</u>	<u>1.45</u>	<u>2.75</u>	<u>4.56</u>
Direct Cost	<u>1.27</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>1.27</u>
Indirect & Overhead	<u>0.54</u>	<u>1.30</u>	<u>-</u>	<u>1.30</u>	<u>1.84</u>
Supervision	<u>-</u>	<u>-</u>	<u>1.45</u>	<u>1.45</u>	<u>1.45</u>
4. <u>O & M Equipment*/</u>	<u>-</u>	<u>-</u>	<u>1.17</u>	<u>1.17</u>	<u>1.17</u>
5. <u>Tax and Duty</u>	<u>7.44</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>7.44</u>
Total (A + B)	<u>39.43</u>	<u>5.57</u>	<u>135.55</u>	<u>141.12</u>	<u>180.55</u>

*/... including water tight rubber, oils, electric switches, tool and so on required for O & M during subsequent three years.

Table X-3 Cost Estimate for Acidic Water Flow Check Facilities

Description	Unit	Quantity	Total (₪)		Local (₪)		Foreign (₪)	
			Rate	Amount	Rate	Amount	Rate	Amount
(A) <u>Ku Bae Ya Hae</u>								
Access/River Diversion	L.S			70,000		7,000		63,000
Excavation	cu.m	280	21	5,880	2	560	19	5,320
Backfill	cu.m	200	13	2,600	1	200	12	2,400
Disposal, 0.5 km	cu.m	80	16	1,280	1	80	15	1,200
RC, 220 kg/cm ²	cu.m	105	4,000	420,000	2,704	283,920	1,296	136,080
RC, 180 kg/cm ²	cu.m	80	3,500	280,000	2,331	186,480	1,169	93,520
Riprap Pitching	cu.m	60	630	37,800	630	37,800	-	-
RC Pile, 0.4x0.4x22 m	P.C.S	15	21,000	315,000	7,350	110,250	13,650	204,750
Slide Gate, 3.0x2.9m	Set	1	160,000	160,000	48,000	48,000	112,000	112,000
O/M Facilities	Unit	1	80,000	80,000	60,000	60,000	20,000	20,000
Miscellaneous	L.S			7,440		3,980		3,460
Total				<u>1,380,000</u>		<u>738,270</u>		<u>641,730</u>

Description	Unit	Quantity	Total (₱)		Local (₱)		Foreign (₱)	
			Rate	Amount	Rate	Amount	Rate	Amount
(B) Sg. Padi, No. 1								
Access/River Diversion	L.S			350,000			35,000	315,000
Excavation	cu.m	6,300	21	132,300	2	12,600	19	119,700
Backfill	cu.m	610	13	7,930	1	610	12	7,320
Disposal, 0.5 km	cu.m	5,690	16	91,040	1	5,690	15	85,350
RC, 220 kg/cm ²	cu.m	590	4,000	2,360,000	2,704	1,595,360	1,296	764,640
RC, 180 kg/cm ²	cu.m	200	3,500	700,000	2,331	466,200	1,169	233,800
Riprap Pitching	cu.m	560	630	352,800	630	352,800	-	-
RC Pile, 0.4x0.4x 28 m	P.C.S	50	26,000	1,300,000	8,606	430,300	17,394	869,700
Radial Gate, 6.0 x 4.5	Set	2	460,000	920,000	138,000	276,000	322,000	644,000
O/M Facilities	Unit	1	80,000	80,000	60,000	60,000	20,000	20,000
Miscellaneous	L.S			5,930		3,047		2,883
Total				<u>6,300,000</u>		<u>3,237,607</u>		<u>3,062,393</u>

Description	Unit	Quantity	Total (₪)		Local (₪)		Foreign (₪)	
			Rate	Amount	Rate	Amount	Rate	Amount
(C) <u>Bang Toei, No. 2</u>								
Access Road/River Diversion	L.S			10,000			1,000	9,000
Excavation	cu.m	220	21	4,620	2	440	19	4,180
Backfill	cu.m	180	13	2,340	1	180	12	2,160
Disposal, 0.5 km	cu.m	40	16	640	1	40	15	600
RC, 180 kg/cm ²	cu.m	35	3,500	122,500	2,331	81,585	1,169	40,915
Riprap Pitching	cu.m	30	630	18,900	630	18,900	-	-
Riprap Grouted	cu.m	25	855	21,375	742	18,550	113	2,825
O/M Facilities	unit	1	80,000	80,000	60,000	60,000	20,000	20,000
Miscellaneous	L.S			9,625			6,680	2,945
Total				<u>270,000</u>		<u>187,375</u>		<u>82,625</u>

Description	Unit	Quantity	Total (₱)		Local (₱)		Foreign (₱)	
			Rate	Amount	Rate	Amount	Rate	Amount
(D) <u>To Lang, No. 2</u>								
Access/River Diversion	L.S			40,000		4,000		36,000
Excavation	cu.m	650	21	13,650	2	1,300	19	12,350
Backfill	cu.m	80	13	1,040	1	80	12	960
Disposal, 0.5 km	cu.m	570	16	9,120	1	570	15	8,550
RC, 220 kg/cm ²	cu.m	60	4,000	240,000	2,704	162,240	1,296	77,760
RC, 180 kg/cm ²	cu.m	50	3,500	175,000	2,331	116,550	1,169	58,450
Riprap Pitching	cu.m	40	630	25,200	630	25,200	-	-
RC Pile, 0.4x0.4x 10m	P.C.S	11	10,250	112,750	3,459	38,049	6,791	74,701
Slide Gate, 2.5x2.0	Set	1	72,000	72,000	21,600	21,600	50,400	50,400
O/M Facilities	unit	1	80,000	80,000	60,000	60,000	20,000	20,000
Miscellaneous	L.S			1,240		693		547
Total				<u>770,000</u>		<u>430,282</u>		<u>339,718</u>

Table X-4 Cost Estimate for Drainage Improvement

Description	Unit	Quantity	Total (฿)		Local (฿)		Foreign (฿)	
			Rate	Amount	Rate	Amount	Rate	Amount
(A) <u>Ban Lo Mo</u>								
Access Road	km	2	80,000	160,000		16,000		144,000
Fill at River Diversion	cu.m	200	16	3,200	1	320		2,880
Excavation by Backhoe	cu.m	5,000	21	105,000	2	10,000	19	95,000
Disposal, 0.5 km	cu.m	2,000	16	32,000	1	2,000	15	30,000
Fill at Both Banks	cu.m	3,000	24	72,000	4	12,000	20	60,000
RC, 220 kg/cm ²	cu.m	14	4,000	56,000	2,704	37,856	1,296	18,144
RC Pipe, ϕ 1,000 mm	m	14	1,800	25,200	630	8,820	1,170	16,380
Miscellaneous	L.S			600		115		485
Total				<u>454,000</u>		<u>87,111</u>		<u>366,889</u>

Description	Unit	Quantity	Total (B)		Local (B)		Foreign (B)	
			Rate	Amount	Rate	Amount	Rate	Amount
(B) K. Ku Ra Po								
Access Road	km	7.8	80,000	624,000	8,000	62,400	72,000	561,600
Clearing/Grubbing	Ha	5.8	10,000	58,000	1,130	6,554	8,870	51,446
Fill at River								
Diversion	cu.m	10,000	16	160,000		16,000		144,000
Excavation by Backhoe	cu.m	75,000	21	1,575,000	2	150,000	19	1,425,000
Disposal, 0.5 km	cu.m	16,000	16	256,000	1	16,000	15	240,000
Fill at Both Banks	cu.m	59,000	24	1,416,000	4	236,000	20	1,180,000
RC, 220 kg/cm ²	cu.m	1,390	4,000	5,560,000	2,704	3,758,560	1,296	1,801,440
RC Pile, 0.4x0.4x10m	P.C.S	52	10,250	533,000	3,459	179,868	6,791	353,132
Riprap Pitching	cu.m	310	630	195,300	630	195,300	-	-
Riprap Grouted	cu.m	220	855	188,100	742	163,240	113	24,860
Miscellaneous	L.S.			600		272		328
Total				<u>10,566,000</u>		<u>4,784,194</u>		<u>5,781,806</u>

Description	Unit	Quantity	Total (₹)		Local (₹)		Foreign (₹)	
			Rate	Amount	Rate	Amount	Rate	Amount
(C) <u>K. Na. Ko</u>								
Access Road	km	5	80,000	400,000	8,000	40,000	72,000	360,000
Clearing/Grubbing	Ha	4.1	10,000	41,000	1,130	4,633	8,870	36,367
Fill at River Diversion	cu.m	9,000	16	144,000		14,400		129,600
Excavation by Backhoe	cu.m	67,000	21	1,407,000	2	134,000	19	1,273,000
Disposal, 0.5 km	cu.m	38,000	16	608,000	1	38,000	15	570,000
Fill at Both Banks	cu.m	29,000	24	696,000	4	116,000	20	580,000
RC, 220 kg/cm ²	cu.m	850	4,000	3,400,000	2,704	2,298,400	1,296	1,101,600
RC Pile, 0.4x0.4x10m	P.C.S	44	10,250	451,000	3,459	152,196	6,791	298,804
RC Pipe, ϕ 1,000 mm	m	30	1,800	54,000	630	18,900	1,170	35,100
Riprap Pitching	cu.m	250	630	157,500	630	157,500	-	-
Riprap Grouted	cu.m	320	855	273,600	742	237,440	113	36,160
Miscellaneous	L.S			900		379		521
Total				7,633,000		3,211,848		4,421,152

Description	Unit	Quantity	Total (₱)		Local (₱)		Foreign (₱)	
			Rate	Amount	Rate	Amount	Rate	Amount
(D-1) K. To Che-K. To Che								
Access Road	km	4.7	80,000	376,000	8,000	37,600	72,000	338,400
Clearing/Grubbing	Ha	6.2	10,000	62,000	1,130	7,006	8,870	54,994
Fill at River Diversion	cu.m	7,000	16	112,000		11,200		100,800
Excavation by Dragline	cu.m	103,000	21	2,163,000	2	206,000	19	1,957,000
Disposal, 0.5 km	cu.m	59,000	16	944,000	1	59,000	15	885,000
Fill at Both Banks	cu.m	44,000	24	1,056,000	4	176,000	20	880,000
RC, 220 kg/cm ²	cu.m	1,100	4,000	4,400,000	2,704	2,974,400	1,296	1,425,600
RC Pile, 0.4x0.4x 10m	P.C.S	43	10,250	440,750	3,459	148,737	6,791	292,013
Riprap Pitching	cu.m	260	630	163,800	630	163,800	-	-
Riprap Grouted	cu.m	130	855	111,150	742	96,460	113	14,690
Miscellaneous	L.S			300		118		182
Total				9,829,000		3,880,321		5,948,679

Description	Unit	Quantity	Total (฿)		Local (฿)		Foreign (฿)	
			Rate	Amount	Rate	Amount	Rate	Amount
<u>(D-2) K. To Che-K.Khok Niang</u>								
Access Road	km	8.5	80,000	680,000	8,000	68,000	72,000	612,000
Clearing/Grubbing	Ha	4	10,000	40,000	1,130	4,520	8,870	35,480
Fill at River Diversion	cu.m	13,000	16	208,000		20,800		187,200
Excavation by Backhoe	cu.m	25,000	21	525,000	2	50,000	19	475,000
Fill at Both Banks	cu.m	25,000	24	600,000	4	100,000	20	500,000
RC, 220 kg/cm ²	cu.m	1,070	4,000	4,280,000	2,704	2,893,280	1,296	1,386,720
RC Pile, 0.4x0.4x 10 m	P.C.S	38	10,250	389,500	3,459	131,442	6,791	258,058
Riprap Pitching	cu.m	170	630	107,100	630	107,100	-	-
Riprap Grouted	cu.m	140	855	119,700	742	103,880	113	15,820
Miscellaneous	L.S			700		350		350
Total				<u>6,950,000</u>		<u>3,479,372</u>		<u>3,470,628</u>

Description	Unit	Quantity	Total (₪)		Local (₪)		Foreign (₪)	
			Rate	Amount	Rate	Amount	Rate	Amount
<u>(D-3) K-To Che-K.Lu Bo Manang</u>								
Access Road	km	4.6	80,000	368,000	8,000	36,800	72,000	331,200
Clearing/Grubbing	Ha	9.9	10,000	99,000	1,130	11,187	8,870	87,813
Fill at River								
Diversions	cu.m	7,000	16	122,000		11,200		100,800
Excavation by Backhoe	cu.m	76,000	21	1,596,000	2	152,000	19	1,444,000
Disposal, 0.5 m	cu.m	25,000	16	400,000	1	25,000	15	375,000
Fill at Both Banks	cu.m	51,000	24	1,224,000	4	204,000	20	1,020,000
RC, 220 kg/cm ²	cu.m	1,460	4,000	5,840,000	2,704	3,947,840	1,296	1,892,160
RC Pile, 0.4x0.4x10m	P.C.S	41	10,250	420,250	3,459	141,819	6,791	278,431
RC Pipe, ϕ 1,000mm	m	51	1,800	91,800	630	32,130	1,170	59,670
Riprap Pitching	cu.m	260	630	163,800	630	163,800	-	-
Riprap Grouted	cu.m	190	855	162,450	742	140,980	113	21,470
Miscellaneous	L.S			700		325		375
Total				10,478,000		4,867,081		5,610,919

Description	Unit	Quantity	Total (₪)		Local (₪)		Foreign (₪)	
			Rate	Amount	Rate	Amount	Rate	Amount
<u>(E-1) K. Chang-K. Chang</u>								
Access Road	km	8.1	80,000	648,000	8,000	64,800	72,000	583,200
Cleaning/Grubbing	Ha	8.8	10,000	88,000	1,130	9,944	8,870	78,056
Fill at River								
Diversions	cu.m	18,000		288,000		28,800		259,200
Excavation by Backhoe	cu.m	152,000		3,192,000	2	304,000	19	2,888,000
Disposal, 0.5 km	cu.m	92,000		1,472,000	1	92,000	15	1,380,000
Fill at Both Banks	cu.m	60,000		1,440,000	4	240,000	20	1,200,000
RC, 220 kg/cm ²	cu.m	1,780	4,000	7,120,000	2,704	4,813,120	1,296	2,306,880
RC Pile, 0.4x0.4x10m	P.C.S	59	10,250	604,750	3,459	204,081	6,791	400,669
Riprap Pitching	cu.m	200	630	126,000	630	126,000	-	-
Riprap Grouted	cu.m	410	855	350,500	742	304,220	113	46,330
Miscellaneous	L.S			700		283		417
Total				<u>15,330,000</u>		<u>6,187,248</u>		<u>9,142,752</u>

Description	Unit	Quantity	Total (฿)		Local (฿)		Foreign (฿)	
			Rate	Amount	Rate	Amount	Rate	Amount
<u>(E-2) K. Chang-K. Ba Ngo Du Dung</u>								
Access Road	Km	8.6	80,000	688,000	8,000	68,800	72,000	619,200
Clearing/Grubbing	Ha	10.2	10,000	102,000	1,130	11,526	8,870	90,474
Fill at River Diversion	cu.m	19,000	16	304,000		30,400		273,600
Excavation by Backhoe	cu.m	170,000	21	3,570,000	2	340,000	19	3,230,000
Disposal, 0.5 km	cu.m	146,000	16	2,336,000	1	146,000	15	2,190,000
Fill at Both Banks	cu.m	24,000	24	576,000	4	96,000	20	480,000
RC, 220 kg/cm ²	cu.m	2,800	4,000	11,200,000	2,704	7,571,200	1,296	3,628,800
RC Pile, 0.4x0.4x10m	P.C.S	85	10,250	871,250	3,459	294,015	6,791	577,235
Riprap Pitching	cu.m	220	630	138,600	630	138,600	-	-
Riprap Grouted	cu.m	440	855	376,200	742	326,480	113	49,720
Miscellaneous	L.S			950		425		525
Total				<u>20,163,000</u>		<u>9,023,446</u>		<u>11,139,554</u>

Description	Unit	Quantity	Total (₱)		Local (₱)		Foreign (₱)	
			Rate	Amount	Rate	Amount	Rate	Amount
(E-3) K.Chang-K.Ku Rong Ya Ma								
Access Road	km	3.9	80,000	312,000	8,000	31,200	72,000	280,800
Clearing/Grubbing	Ha.	4.1	10,000	41,000	1,130	4,633	8,870	36,367
Full at River Diversion	cu.m	9,000	16	144,000		14,400		129,600
Excavation by Backhoe	cu.m	60,000	21	1,260,000	2	120,000	19	1,140,000
Disposal, 0.5 km	cu.m	40,000	16	640,000	1	40,000	15	600,000
Fill at Both Banks	cu.m	20,000	24	480,000	4	80,000	20	400,000
RC, 220 kg/cm ²	cu.m	990	4,000	3,960,000	2,704	2,676,960	1,296	1,283,040
RC Pile, 0.4x0.4x10m P.C.S	P.C.S	25	10,250	256,250	3,459	86,475	6,791	169,775
Riprap Grouted	cu.m	310	855	265,050	742	230,020	113	35,030
Miscellaneous	L.S			700		312		388
Total				<u>7,359,000</u>		<u>3,284,000</u>		<u>4,075,000</u>

Description	Unit	Quantity	Total (₹)		Local (₹)		Foreign (₹)	
			Rate	Amount	Rate	Amount	Rate	Amount
<u>(F) Ban Sala Pradu</u>								
Access Road	km	0.9	80,000	72,000	8,000	7,200	72,000	64,800
Fill at River Diversion	cu.m	100	16	1,600		160		1,440
Excavation by Backhoe	cu.m	4,000	21	84,000	2	8,000	19	76,000
Disposal, 0.5 km	cu.m	2,000	16	32,000	1	2,000	15	30,000
Fill at Both Banks	cu.m	2,000	24	48,000	4	8,000	20	40,000
RC, 220 kg/cm ²	cu.m	20	4,000	80,000	2,704	54,080	1,296	25,920
RC Pipe, φ1,000 mm	m	30	1,800	54,000	630	18,900	1,170	35,100
Miscellaneous	L.S			400		106		294
Total				<u>372,000</u>		<u>98,446</u>		<u>273,554</u>

Description	Unit	Quantity	Total (฿)		Local (฿)		Foreign (฿)	
			Rate	Amount	Rate	Amount	Rate	Amount
(G) <u>K. Sala Mai</u>								
Access Road	km	5.4	80,000	432,000	8,000	43,200	72,000	388,800
Clearing/Grubbing	Ha	3.5	10,000	35,000	1,130	3,955	8,870	31,045
Fill at River Diversion	cu.m	6,000	16	96,000		9,600		86,400
Excavation by Backhoe	cu.m	31,000	21	651,000	2	62,000	19	589,000
Fill at Both Banks	cu.m	30,000	24	720,000	4	120,000	20	600,000
Disposal, 0.5 km	cu.m	1,000	16	16,000	1	1,000	15	15,000
RC, 220 kg/cm ²	cu.m	550	4,000	2,200,000	2,704	1,487,200	1,296	712,800
RC Pile, 0.4x0.4x10m	P.C.S	60	10,250	615,000	3,459	207,540	6,791	407,460
Riprap Pitching	cu.m	170	630	107,100	630	107,100	-	-
Riprap Grouted	cu.m	290	855	247,950	742	215,180	113	32,770
Miscellaneous	L.S			950		419		531
Total				<u>5,121,000</u>		<u>2,257,194</u>		<u>2,863,806</u>

Table X-5 Cost Estimate for RID Pumping Irrigation

Description	Unit	Quantity	Total (₪)		Local (₪)		Foreign (₪)	
			Rate	Amount	Rate	Amount	Rate	Amount
<u>(A) Pu Ta</u>								
<u>A-1 Civil Work</u>								
Access Road	km	4.1	80,000	328,000	8,000	32,800	72,000	295,200
Excavation	cu.m	2,400	21	50,400	2	4,800	19	45,600
Backfill	cu.m	200	13	2,600	1	200	12	2,400
Fill by Excavation, 3 km	cu.m	2,200	48	105,600	5	11,000	43	94,600
Fill by Borrow, 10km	cu.m	9,100	87	791,700	8	72,800	79	718,900
Sand Bed	cu.m	90	140	12,600	140	12,600	-	-
Lining Concrete	cu.m	1,460	1,800	2,628,000	1,079	1,575,340	721	1,052,660
RC, 220 kg/cm ²	cu.m	80	4,000	320,000	2,704	216,320	1,296	103,680
Plain Concrete	cu.m	60	2,650	159,000	2,257	135,420	393	23,580
PC Pipe, ø600	cu.m	50	1,870	93,500	654	32,700	1,216	60,800
RC Pipe, ø600	cu.m	16	1,000	16,000	350	5,600	650	10,400
RC Pipe, ø450	cu.m	10	740	7,400	260	2,600	480	4,800
RC Pipe, ø225	cu.m	65	440	28,600	154	10,000	286	18,600
Riprap Pitching	cu.m	55	630	34,650	630	34,650	-	-
Riprap Grouted	cu.m	10	855	8,550	742	7,420	113	1,130
Lean Concrete	cu.m	10	1,570	15,700	1,177	11,770	393	3,930
Slide Gate, 0.4x0.4m	set	13	4,000	52,000	1,200	15,600	2,800	36,400
Slide Gate, 0.6x0.6m	set	2	7,000	14,000	2,100	4,200	4,900	9,800

Description	Unit	Quantity	Total (B)		Local (B)		Foreign (B)		
			Rate	Amount	Rate	Amount	Rate	Amount	
Slide Gate, 0.8x0.3m	set	1	6,000	6,000	1,800	1,800	4,200	4,200	
Slide Gate, 1.1x0.4m	set	1	9,000	9,000	2,700	2,700	6,300	6,300	
Miscellaneous	L.S			28,090			28,090	-	
Sub-total				<u>4,711,390</u>			<u>2,218,410</u>	<u>2,492,980</u>	
A-2 Pumping Plant									
Pump, Ø300, 2 units	L.S			1,951,000			-	1,951,000	
Ocean Freight	L.S			127,000			-	127,000	
Inland Transport	L.S			32,000			10,000	22,000	
Installation	L.S			139,000			83,000	56,000	
Transformer, 50 KVA	set	1	87,000	87,000			26,100	60,900	
Capacitor, 50 KVA	set	1	5,500	5,500			1,650	3,850	
Power Line	km	1	156,000	156,000			78,000	78,000	
Tax and Duty	L.S			584,000			584,000	-	
O/M Facilities	Unit	3	80,000	240,000			180,000	60,000	
Sub-total				<u>3,321,500</u>			<u>962,750</u>	<u>2,358,750</u>	
Total				<u>8,032,890</u>			<u>3,181,160</u>	<u>4,851,730</u>	

Description	Unit	Quantity	Total (฿)			Local (฿)			Foreign (฿)				
			Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount			
(B) Khao Kong													
B-1 Civil Work													
Access Road	km	13.5	80,000	1,080,000	8,000	108,000	72,000	972,000					
Excavation	cu.m	3,800	21	79,800	2	7,600	19	72,200					
Backfill	cu.m	200	13	2,600	1	200	12	2,400					
Fill by Excavation, 3 km	cu.m	3,600	48	172,800	5	18,000	43	154,800					
Fill by Borrow, 10km	cu.m	95,800	87	8,334,600	8	766,400	79	7,568,200					
Sand Bed	cu.m	90	140	12,600	140	12,600		-					
Lining concrete	cu.m	2,620	1,800	4,716,000	1,079	2,826,900	721	1,889,020					
RC, 220 kg/cm ²	cu.m	280	4,000	1,120,000	2,704	757,120	1,296	362,880					
Plain Concrete	cu.m	240	2,650	636,000	2,257	541,680	393	94,320					
PC Pipe, ø600	m	50	1,870	93,500		32,700		60,800					
RC Pipe, ø1,000	m	140	1,800	252,000		88,200		163,800					
RC Pipe, ø800	m	14	1,300	18,200		6,400		11,800					
RC Pipe, ø600	m	38	1,000	38,000		13,300		24,700					
RC Pipe, ø500	m	10	800	8,000		2,800		5,200					
RC Pipe, ø450	m	10	740	7,400		2,600		4,800					
RC Pipe, ø300	m	25	600	15,000		5,200		9,800					
RC Pipe, ø225	m	155	440	68,200		23,900		44,300					
Riprap Pitching	cu.m	135	630	85,050		85,050		-					
Riprap Grouted	cu.m	13	855	11,115	742	9,646	113	1,469					

Description	Unit	Quantity	Total (₱)		Local (₱)		Foreign (₱)	
			Rate	Amount	Rate	Amount	Rate	Amount
Lean Concrete	cu.m	26	1,570	40,820	1,177	30,602	393	10,218
Slide Gate, 1.4x0.5m	set	3	12,000	36,000		10,800		25,200
Slide Gate, 1.1x0.4m	set	4	9,000	36,000		10,800		25,200
Slide Gate 0.8x0.3m	set	2	6,000	12,000		3,600		8,400
Slide Gate, 0.6x0.6m	set	2	7,000	14,000		4,200		9,800
Slide Gate, 0.4x0.4m	set	36	4,000	144,000		43,200		100,800
Miscellaneous	L.S			46,290		46,290		
Sub-total				17,079,975		5,457,788		11,622,187
B-2 Pumping Plant								
Pump, 450 mm, 2 units	L.S			2,933,000		-		2,933,000
Ocean Freight	L.S			191,000		-		191,000
Inland transport	L.S			48,000		15,000		33,000
Installation	L.S			210,000		126,000		84,000
Transformer, 150 KVA	set	1	125,000	125,000		37,500		87,500
Capacitor, 150 KVA	set	1	9,500	9,500		2,850		6,650
Power Line	km	1.0	156,000	156,000		78,000		78,000
Tax and Duty	L.S			879,000		879,000		-
O/M Facilities	unit	3	80,000	240,000		180,000		60,000
Sub-total				4,791,500		1,318,350		3,473,150
Total				21,871,475		6,776,138		15,095,337

Description	Unit	Quantity	Total (฿)		Local (฿)		Foreign (฿)	
			Rate	Amount	Rate	Amount	Rate	Amount
(C) Du Song								
C-1 Civil Work								
Access Road	km	16.0	80,000	1,280,000	8,000	128,000	72,000	1,152,000
Excavation	cu.m	24,100	21	506,100	2	48,200	19	457,900
Backfill	cu.m	11,400	13	148,200	1	11,400	12	136,800
Fill by Excavation, 3 km	cu.m	12,700	48	609,600	5	63,500	43	546,100
Fill by Borrow, 10km	cu.m	87,800	87	7,638,600	8	702,400	79	6,936,200
Sand Bed	cu.m	7,570	140	1,059,800	140	1,059,800	-	-
Lining Concrete	cu.m	3,150	1,800	5,670,000	1,079	3,398,850	721	2,271,150
RC, 220 kg/cm ²	cu.m	350	4,000	1,400,000	2,704	946,400	1,296	453,600
Plain Concrete	cu.m	300	2,650	795,000	2,259	677,100	393	117,900
PC Pipe, ø900	m	2,600	3,000	7,800,000		2,730,000		5,070,000
RC Pipe, ø1,000	m	84	1,800	151,200		52,900		98,300
RC Pipe, ø800	m	7	1,300	9,100		3,200		5,900
RC Pipe, ø600	m	93	1,000	93,000		32,500		60,500
RC Pipe, ø500	m	5	800	4,000		1,400		2,600
RC Pipe, ø450	m	20	740	14,800		5,200		9,600
RC Pipe, ø300	m	10	600	6,000		2,100		3,900
RC Pipe, ø225	m	240	440	105,600		37,000		68,600
Riprap Piching	cu.m	128	630	80,640		80,640		-
Riprap Grouted	cu.m	16	855	13,680	742	11,873	113	1,808

Description	Unit	Quantity	Total (₱)		Local (₱)		Foreign (₱)	
			Rate	Amount	Rate	Amount	Rate	Amount
Lean Concrete	cu.m	33	1,570	51,810	1,177	38,841	393	12,969
Slide Gate, 1.7x0.6m	set	1	17,000	17,000		5,100		11,900
Slide Gate, 1.4x0.5m	set	5	12,000	60,000		18,000		42,000
Slide Gate, 1.1x0.4m	set	1	9,000	9,000		2,700		6,300
Slide Gate, 0.8x0.3m	set	2	6,000	12,000		3,600		8,400
Slide Gate, 0.8x0.8m	set	1	10,000	10,000		3,000		7,000
Slide Gate, 0.6x0.6m	set	4	7,000	28,000		8,400		19,600
Slide Gate, 0.4x0.4m	set	51	4,000	204,000		61,200		142,800
Miscellaneous	L.S			13,950		13,950		-
Sub-total				27,791,080		10,147,253		17,643,827
C-2 Pumping Plant								
Pump, 500 mm, 2 units	L.S			4,563,000		-		4,563,000
Ocean Freight	L.S			297,000		-		297,000
Inland Transport	L.S			74,000		22,000		52,000
Installation	L.S			327,000		196,000		131,000
Transformer, 400KVA	set	1	225,000	225,000		67,500		157,500
Capacitor, 400KVA	set	1	22,500	22,500		6,750		15,750
Power Line	km	0.6	156,000	93,600		46,800		46,800
Tax and Duty	L.S			1,368,000		1,368,000		-
O/M Facilities	unit	3	80,000	240,000		180,000		60,000
Sub-total				7,210,100		1,887,050		5,323,050
Total				35,001,180		12,034,303		22,966,877

Description	Unit	Quantity	Total (₪)		Local (₪)		Foreign (₪)	
			Rate	Amount	Rate	Amount	Rate	Amount
(D) <u>Tan Yong Mat</u>								
D-1 <u>Civil Work</u>								
Access Road	km	15.1	80,000	1,208,000	8,000	120,800	72,000	1,087,200
Excavation	cu.m	10,200	21	214,200	2	20,400	19	193,800
Backfill	cu.m	400	13	5,200	1	400	12	4,800
Fill by Excavation, 3 km	cu.m	9,800	48	470,400	5	49,000	43	421,400
Fill by Borrow, 10km	cu.m	45,200	87	3,932,400	8	361,600	79	3,570,800
Sand Bed	cu.m	290	140	40,600	140	40,600	-	-
Lining Concrete	cu.m	2,560	1,800	4,608,000	1,079	2,762,240	721	1,845,760
RC, 220 kg/cm ²	cu.m	440	4,000	1,760,000	2,704	1,189,760	1,296	570,240
Plain Concrete	cu.m	330	2,650	874,500	2,257	744,810	393	129,690
PC Pipe, ϕ900	m	100	3,000	300,000		105,000		195,000
RC Pipe, ϕ1,000	m	171	1,800	307,800		107,800		200,000
RC Pipe, ϕ800	m	24	1,300	31,200		10,900		20,300
RC Pipe, ϕ600	m	47	1,000	47,000		16,400		30,600
RC Pipe, ϕ500	m	5	800	4,000		1,400		2,600
RC Pipe, ϕ450	m	20	740	14,800		5,200		9,600
RC Pipe, ϕ300	m	5	600	3,000		1,000		2,000
RC Pipe, ϕ225	m	285	440	125,400		43,900		81,500
Riprap Pitching	m ³	400	630	252,000		252,000		-
Riprap Grouted	cu.m	20	850	17,000		15,300		1,700

Description	Unit	Quantity	Total (₹)		Local (₹)		Foreign (₹)	
			Rate	Amount	Rate	Amount	Rate	Amount
Lean Concrete	cu.m	40	1,570	62,800	1,177	47,080	393	15,720
Slide Gate, 2.3x0.8m	set	2	29,000	58,000		17,400		40,600
Slide Gate, 2.0x0.7m	set	1	25,000	25,000		7,500		17,500
Slide Gate, 1.7x0.6m	set	1	17,000	17,000		5,100		11,900
Slide Gate, 1.4x0.5m	set	1	12,000	12,000		3,600		8,400
Slide Gate, 1.1x0.4m	set	1	9,000	9,000		2,700		6,300
Slide Gate, 0.8x0.3m	set	1	6,000	6,000		1,800		4,200
Slide Gate, 0.8x0.8m	set	4	10,000	40,000		12,000		28,000
Slide Gate, 0.6x0.6m	set	5	7,000	35,000		10,500		24,500
Slide Gate, 0.4x0.4m	set	58	4,000	232,000		69,600		162,400
Miscellaneous	L.S			37,700		37,700		-
Sub-total				<u>14,750,000</u>		<u>6,063,490</u>		<u>8,686,510</u>
D-2 Pumping Plant								
Pump, 600 mm, 2 units	L.S			4,048,000		-		4,048,000
Ocean Freight	L.S			263,000		-		263,000
Inland Transport	L.S			66,000		20,000		46,000
Installation	L.S			289,000		174,000		115,000
Transformer, 150KVA	set	1	125,000	125,000		37,500		87,500
Capacitor, 150KVA	set	1	9,500	9,500		2,800		6,700
Power Line	km	5.5	156,000	858,000		429,000		429,000
Tax and Duty	L.S			1,213,000		1,213,000		-

Description	Unit	Quantity	Total (£)		Local (£)		Foreign (£)	
			Rate	Amount	Rate	Amount	Rate	Amount
O/M Facilities	unit	3	80,000	240,000	60,000	180,000	20,000	60,000
Sub-total				<u>7,111,500</u>		<u>1,140,500</u>		<u>5,971,000</u>
Total				<u>21,861,500</u>		<u>8,119,790</u>		<u>13,741,710</u>

Description	Unit	Quantity	Total (฿)		Local (฿)		Foreign (฿)	
			Rate	Amount	Rate	Amount	Rate	Amount
(E) Khok Ti Te								
E-1 Civil Work								
Access road	km	26.2	80,000	2,096,000	8,000	209,600	72,000	1,886,400
Excavation	cu.m	42,400	21	890,400	2	84,800	19	805,600
Backfill	cu.m	22,300	13	289,900	1	22,300	12	267,600
Fill by Excavation, 3 km	cu.m	20,100	48	964,800	5	100,500	43	864,300
Fill by Borrow, 10km	cu.m	146,300	87	12,728,100	8	1,170,400	79	11,557,700
Sand Bed	cu.m	14,330	140	2,006,200	140	2,006,200		-
Lining Concrete	cu.m	4,670	1,800	8,406,000	1,079	5,038,930	721	3,367,070
RC, 220 kg/cm ²	cu.m	520	4,000	2,080,000	2,704	1,406,080	1,296	673,920
Plain Concrete	cu.m	360	2,650	954,000	2,077	747,720	573	206,280
PC pipe, ø800	m	5,800	2,400	13,920,000		4,872,000		9,048,000
RC pipe, ø1000	m	84	1,800	151,200		52,900		98,300
RC pipe, ø800	m	14	1,300	18,200		6,400		11,800
RC pipe, ø600	m	131	1,000	131,000		45,800		85,200
RC pipe, ø500	m	15	800	12,000		4,200		7,800
RC pipe, ø450	m	15	740	11,100		3,900		7,200
RC pipe, ø300	m	55	600	33,000		11,500		21,500
RC pipe, ø225	m	320	440	140,800		49,300		91,500
Riprap pitching	cu.m	260	630	163,800		163,800		-
Riprap grouted	cu.m	20	855	17,100	742	14,840	113	2,260

Description	Unit	Quantity	Total (₪)		Local (₪)		Foreign (₪)	
			Rate	Amount	Rate	Amount	Rate	Amount
Lean concrete	cu.m	44	1,570	69,080	997	43,868	573	25,212
Slide gate, 1.4x0.5m	set	5	12,000	60,000		18,000		42,000
Slide gate, 1.1x0.4m	set	4	9,000	36,000		10,800		25,200
Slide gate, 0.8x0.3m	set	6	6,000	36,000		10,800		25,200
Slide gate, 0.6x0.6m	set	5	7,000	35,000		10,500		24,500
Slide gate, 0.4x0.4m	set	75	4,000	300,000		90,000		210,000
Miscellaneous	L.S			50,320		50,320		-
Sub-total				<u>45,600,000</u>		<u>16,245,458</u>		<u>29,354,542</u>

Description	Unit	Quantity	Total (₪)		Local (₪)		Foreign (₪)	
			Rate	Amount	Rate	Amount	Rate	Amount
<u>E-2 Pumping Plant (Upper-Zone)</u>								
Pump, 450 mm, 2 units	L.S			4,150,000	-	-	4,150,000	
Ocean Freight	L.S			270,000	-	-	270,000	
Inland transport	L.S			68,000		34,000	34,000	
Installation	L.S			297,000		178,000	119,000	
Transformer, 500 KVA	set	1	265,000	265,000		79,500	185,500	
Capacitor, 500 KVA	set	1	27,500	27,500		8,200	19,300	
Power line	km	4.5	156,000	702,000		351,000	351,000	
Tax and Duty	L.S			1,244,000		1,244,000	-	
O/M facilities	unit	3	80,000	240,000		180,000	60,000	
Sub-total				<u>7,263,500</u>		<u>2,074,700</u>	<u>5,188,800</u>	
<u>E-3 Pumping Plant (lower-Zone)</u>								
Pump, 400 mm, 2 units	L.S			3,015,000	-	-	3,015,000	
Ocean Freight	L.S			196,000	-	-	196,000	
Inland Transport	L.S			49,000		15,000	34,000	
Installation	L.S			216,000		129,000	87,000	
Transformer, 500 KVA	set	1	265,000	265,000		79,500	185,500	
Capacitor, 500 KVA	set	1	27,500	27,500		8,200	19,300	
Power Line	km	4.5	156,000	702,000		351,000	351,000	
Tax and Duty	L.S	1		904,000		904,000	-	
O/M Facilities	unit	3	80,000	240,000		180,000	60,000	
Sub-total				<u>5,614,500</u>		<u>1,666,700</u>	<u>3,947,800</u>	
Total				<u>58,478,000</u>		<u>19,986,858</u>	<u>38,491,142</u>	

Description	Unit	Quantity	Total (₪)		Local (₪)		Foreign (₪)	
			Rate	Amount	Rate	Amount	Rate	Amount
(F) Maru Bo								
F-1 Civil Work								
Access Road	km	7.5	80,000	600,000	8,000	60,000	7,200	540,000
Excavation	cu.m	9,500	21	199,500	2	19,000	19	180,500
Backfill	cu.m	4,400	13	57,200	1	4,400	12	52,800
Fill by Excavation, 3 km	cu.m	5,100	48	244,800	5	25,500	43	219,300
Fill by Borrow, 10km	cu.m	42,200	87	3,671,400	8	337,600	79	3,333,800
Sand Bed	cu.m	2,760	140	386,400	140	386,400	-	-
Lining Concrete	cu.m	1,450	1,800	2,610,000	1,079	1,564,550	721	1,045,450
RC, 220 kg/cm ²	cu.m	180	4,000	720,000	2,704	486,720	1,296	233,280
Plain concrete	cu.m	160	2,650	424,000	2,077	332,320	573	91,680
PC pipe, ø700	m	1,300	2,270	2,951,000		1,032,900		1,918,100
RC pipe, ø1000	m	84	1,800	151,200		52,900		98,300
RC pipe, ø600	m	10	1,000	10,000		3,500		6,500
RC pipe, ø500	m	5	800	4,000		1,400		2,600
RC pipe, ø300	m	5	600	3,000		1,000		2,000
RC pipe, ø225	m	125	440	55,000		19,200		35,800
Riprap pitching	cu.m	110	630	69,300		69,300		-
Riprap grouted	cu.m	15	855	12,825	742	11,130	113	1,695
Lean concrete	cu.m	20	1,570	31,400	997	19,940	573	11,460

Description	Unit	Quantity	Total (₱)		Local (₱)		Foreign (₱)	
			Rate	Amount	Rate	Amount	Rate	Amount
Slide gate, 1.4x0.5m	set	1	12,000	12,000		3,600		8,400
Slide gate, 0.8x0.3m	set	4	6,000	24,000		7,200		16,800
Slide gate, 0.8x0.8m	set	2	10,000	20,000		6,000		14,000
Slide gate, 0.6x0.6m	set	1	7,000	7,000		2,100		4,900
Slide gate, 0.4x0.4m	set	26	4,000	104,000		31,200		72,800
Miscellaneous	L.S			21,975		21,975		-
Sub-total				<u>12,390,000</u>		<u>4,499,835</u>		<u>7,890,165</u>
F-2 Pumping Plant								
Pump, 400 mm, 2 units	L.S			2,771,000		-		2,771,000
Ocean Freight	L.S			180,000		-		180,000
Inland transport	L.S			45,000		13,000		32,000
Installation	L.S			198,000		119,000		79,000
Transformer, 200 KVA	set	1	145,000	145,000		43,500		101,500
Capacitor, 200 KVA	set	1	12,500	12,500		3,700		8,800
Power line	km	1.2	156,000	187,200		93,600		93,600
Tax and Duty	L.S	1		830,000		830,000		-
D/M facilities	unit	3	80,000	240,000		180,000		60,000
Sub-total				<u>4,608,700</u>		<u>1,282,800</u>		<u>3,325,900</u>
Total				<u>16,998,700</u>		<u>5,782,635</u>		<u>11,216,065</u>

Description	Unit	Quantity	Total (₱)		Local (₱)		Foreign (₱)	
			Rate	Amount	Rate	Amount	Rate	Amount
(G) <u>Sala Mai</u>								
G-1 <u>Civil Work</u>								
Access Road	km	9.4	80,000	752,000	8,000	75,200	72,000	676,800
Excavation	cu.m	6,300	21	132,300	2	12,600	19	119,700
Backfill	cu.m	2,400	13	31,200	1	2,400	12	28,800
Fill by Excavation, 3km	cu.m	3,900	48	187,200	5	19,500	43	167,700
Fill by Borrow, 10km	cu.m	40,400	87	3,514,800	8	323,200	79	319,600
Sand Bed	cu.m	1,480	140	207,200	140	207,200	-	-
Lining concrete	cu.m	1,790	1,800	3,222,000	1,079	1,931,410	721	1,290,590
RC, 220 kg/cm ²	cu.m	160	4,000	640,000	2,704	432,640	1,296	207,360
Plain concrete	cu.m	120	2,650	318,000	2,077	249,240	573	68,760
PC pipe, ø700	m	700	2,270	1,589,000		556,100		1,032,900
RC pipe, ø600	m	23	1,000	23,000		8,000		15,000
RC pipe, ø500	m	5	800	4,000		1,400		2,600
RC pipe, ø450	m	5	740	3,700		1,300		2,400
RC pipe, ø300	m	10	600	6,000		2,100		3,900
RC pipe, ø225	m	135	440	59,400		20,800		38,600
Riprap pitching	cu.m	73	630	45,990		45,990		-
Riprap grouted	cu.m	13	855	11,115	742	9,646	113	1,469
lean concrete	cu.m	14	1,570	21,980	997	13,958	573	8,022
Slide gate, 1.4x0.5m set	set	2	12,000	24,000		7,200		16,800

Description	Unit	Quantity	Total (₹)		Local (₹)		Foreign (₹)	
			Rate	Amount	Rate	Amount	Rate	Amount
Slide gate, 1.1x0.4m	set	1	9,000	9,000	2,700	6,300		
Slide gate, 0.8x0.3m	set	1	6,000	6,000	1,800	4,200		
Slide gate, 0.8x0.8m	set	1	10,000	10,000	3,000	7,000		
Slide gate, 0.6x0.6m	set	2	7,000	14,000	4,200	9,800		
Slide gate, 0.4x0.4m	set	29	4,000	116,000	34,800	81,200		
Miscellaneous	L.S			32,115				
Sub-total				<u>10,980,000</u>	<u>3,998,499</u>	<u>6,981,501</u>		
G.2 Pumping Plant								
Pump, 400 mm, 2 units	L.S			2,501,000	-	2,501,000		
Ocean Freight	L.S			163,000	-	163,000		
Inland transport	L.S			41,000	13,000	28,000		
Installation	L.S			179,000	108,000	71,000		
Transformer, 150 KVA	set	1	125,000	125,000	37,500	87,500		
Capacitor, 150 KVA	set	1	9,500	9,500	2,800	6,700		
Power line	km	0.5	156,000	78,000	39,000	39,000		
Tax and Duty	L.S			750,000	750,000	-		
O/M facilities	unit	3	80,000	240,000	180,000	60,000		
Sub-total				<u>4,086,500</u>	<u>1,130,300</u>	<u>2,956,200</u>		
Total				<u>15,066,500</u>	<u>5,128,799</u>	<u>9,937,701</u>		

Description	Unit	Quantity	Total (฿)		Local (฿)		Foreign (฿)	
			Rate	Amount	Rate	Amount	Rate	Amount
(H) Ko Sawat								
H-1 Civil Work								
Access Road	km	12.0	80,000	960,000	8,000	96,000	72,000	864,000
Excavation	cu.m	3,200	21	67,200	2	6,400	19	60,800
Backfill	cu.m	200	13	2,600	1	200	12	2,400
Fill by Excavation, 3 km	cu.m	3,000	48	144,000	5	15,000	43	129,000
Fill by Borrow, 10km	cu.m	77,300	87	6,725,100	8	618,400	79	6,106,700
Sand Bed	cu.m	120	140	16,800	140	16,800	-	-
Lining concrete	cu.m	2,440	1,800	4,392,000	1,079	2,632,760	721	1,759,240
RC, 220 kg/cm ²	cu.m	200	4,000	800,000	2,704	540,800	1,296	259,200
Plain concrete	cu.m	180	2,650	477,000	2,077	373,860	573	103,140
PC pipe, ø800	m	50	2,400	120,000		42,000		78,000
RC pipe, ø1000	m	56	1,800	100,800		35,300		65,500
RC pipe, ø800	m	7	1,300	9,100		3,200		5,900
RC pipe, ø600	m	32	1,000	32,000		11,200		30,800
RC pipe, ø500	m	5	800	4,000		1,400		2,600
RC pipe, ø300	m	35	600	21,000		7,300		13,700
RC pipe, ø225	m	145	440	63,800		22,300		41,500
Riprap pitching	cu.m	98	630	61,740		61,740		-
Riprap grouted	cu.m	13	855	11,115	742	9,646	113	1,469
Lean concrete	cu.m	19	1,570	29,830	997	18,943	573	10,887

Description	Unit	Quantity	Total (£)		Local (£)		Foreign (£)	
			Rate	Amount	Rate	Amount	Rate	Amount
Slide gate, 1.7x0.6m	set	2	17,000	34,000		10,200		23,800
Slide gate, 1.4x0.5m	set	2	12,000	24,000		7,200		16,800
Slide gate, 0.8x0.8m	set	1	10,000	10,000		3,000		7,000
Slide gate, 0.6x0.6m	set	1	7,000	7,000		2,100		4,900
Slide gate, 0.4x0.4m	set	36	4,000	144,000		43,200		100,800
Miscellaneous	L.S			22,915		22,915		-
Sub-total				<u>14,280,000</u>		<u>4,601,864</u>		<u>9,678,136</u>
H-2 Pumping Plant								
Pump, 400 mm, 2 units	L.S			2,602,000		-		2,602,000
Ocean Freight	L.S			169,000		-		169,000
Inland transport	L.S			42,000		12,000		30,000
Installation	L.S			186,000		112,000		74,000
Transformer, 200 KVA	set	1	145,000	145,000		43,500		101,500
Capacitor, 200 kVA	set	1	12,500	12,500		3,700		8,800
Power line	km	0.1	156,000	15,600		7,800		7,800
Tax and Duty	L.S			780,000		780,000		-
O/M facilities	unit	3	80,000	240,000		180,000		60,000
Sub-total				<u>4,192,100</u>		<u>1,139,000</u>		<u>3,053,100</u>
Total				<u>18,472,100</u>		<u>5,740,864</u>		<u>12,731,236</u>

Description	Unit	Quantity	Total (฿)		Local (฿)		Foreign (฿)	
			Rate	Amount	Rate	Amount	Rate	Amount
(I) Phru Kap Daeng								
I-1 Civil Work								
Access road	km	11.4	80,000	912,000	8,000	91,200	72,000	820,800
Excavation	cu.m	3,800	21	79,800	2	7,600	19	72,200
Backfill	cu.m	200	13	2,600	1	200	12	2,400
Fill by Excavation, 3 km	cu.m	3,600	48	172,800	5	18,000	43	154,800
Fill by Borrow, 10km	cu.m	58,900	87	5,124,300	8	471,200	79	4,653,100
Sand Bed	cu.m	110	140	15,400	140	15,400	-	-
Lining Concrete	cu.m	2,310	1,800	4,158,000	1,079	2,492,490	721	1,665,510
RC, 220 kg/cm ²	cu.m	120	4,000	480,000	2,704	324,480	1,296	155,520
Plain concrete	cu.m	100	2,650	265,000	2,077	207,700	573	57,300
PC pipe, ø700	m	50	2,270	113,500		39,700		73,800
RC pipe, ø600	m	16	1,000	16,000		5,600		10,400
RC pipe, ø500	m	5	800	4,000		1,400		2,600
RC pipe, ø450	m	10	740	7,400		2,600		4,800
RC pipe, ø300	m	15	600	9,000		3,100		5,900
RC pipe, ø225	m	105	440	46,200		16,200		30,000
Riprap pitching	cu.m	64	630	40,320		40,320		-
Riprap grouted	cu.m	11	855	9,405	742	8,162	113	1,243
Lean concrete	cu.m	11	1,570	17,270	997	10,967	573	6,303

Description	Unit	Quantity	Total (¥)		Local (₱)		Foreign (₱)	
			Rate	Amount	Rate	Amount	Rate	Amount
Slide gate, 1.7x0.6m set		1	17,000	17,000	5,100	11,900		
Slide gate, 1.1x0.4m set		1	9,000	9,000	2,700	6,300		
Slide gate, 0.6x0.6m set		3	7,000	21,000	6,300	14,700		
Slide gate, 0.4x0.4m set		24	4,000	96,000	28,800	67,200		
Miscellaneous	L.S			24,005	24,005	-		
Sub-total				<u>11,640,000</u>	<u>3,823,224</u>	<u>7,816,776</u>		
I-2 Pumping Plant								
Pump, 400 mm, 2 units	L.S			2,519,000	-	2,519,000		
Ocean Freight	L.S			164,000	-	164,000		
Inland transport	L.S			41,000	12,000	29,000		
Installation	L.S			180,000	108,000	72,000		
Tax and Duty	L.S			755,000	755,000	-		
O/M facilities	units	3	80,000	240,000	180,000	60,000		
Sub-total				<u>3,899,000</u>	<u>1,055,000</u>	<u>2,844,000</u>		
Total				<u>15,539,000</u>	<u>4,878,224</u>	<u>10,660,776</u>		

Description	Unit	Quantity	Total (฿)		Local (฿)		Foreign (฿)	
			Rate	Amount	Rate	Amount	Rate	Amount
(J) <u>Ku Cham</u>								
J-1 <u>Civil Work</u>								
Access road	km	6.2	80,000	496,000	8,000	49,600	72,000	446,400
Excavation	cu.m	5,900	21	123,900	2	11,800	19	112,100
Backfill	cu.m	2,900	13	37,700	1	2,900	12	34,800
Fill by Excavation, 3 km	cu.m	3,000	48	144,000	5	15,000	43	129,000
Fill by Borrow, 10km	cu.m	77,000	87	6,699,000	8	616,000	79	6,083,000
Sand Bed	cu.m	1,740	140	243,600	140	243,600		-
Lining concrete	cu.m	1,070	1,800	1,926,000	1,079	1,154,530	721	771,470
RC, 220 kg/cm ²	cu.m	60	4,000	240,000	2,704	162,240	1,296	77,760
Plain concrete	cu.m	60	2,650	159,000	2,077	124,620	573	34,380
PC pipe, ø600	m	1,000	1,870	1,870,000		654,500		1,215,500
RC pipe, ø600	m	7	1,000	7,000		2,400		4,600
RC pipe, ø500	m	5	800	4,000		1,400		2,600
RC pipe, ø300	m	20	600	12,000		4,200		7,800
RC pipe, ø225	m	55	440	24,200		8,500		15,700
Riprap pitching	cu.m	46	630	28,980		28,980		-
Riprap grouted	cu.m	8	855	6,840	742	5,936	113	904
Lean concrete	cu.m	6	1,570	9,420	997	5,982	573	3,438
Slide gate, 1.4x0.5m set	set	1	12,000	12,000		3,600		8,400
Slide gate, 1.6x0.6m set	set	1	7,000	7,000		2,100		4,900

Description	Unit	Quantity	Total (₪)		Local (₪)		Foreign (₪)	
			Rate	Amount	Rate	Amount	Rate	Amount
Slide gate, 0.4x0.4m	set	15	4,000	60,000	18,000	42,000		
Miscellaneous	L.S			360	360	-		
Sub-total				<u>12,111,000</u>	<u>3,116,248</u>	<u>8,994,752</u>		
J-2 Pumping Plant								
Pump, 300 mm, 2 units	L.S			1,869,000	-	1,869,000		
Ocean Freight	L.S			121,000	-	121,000		
Inland transport	L.S			30,000	9,000	21,000		
Installation	L.S			134,000	80,000	54,000		
Transformer, 50 KVA	set	1	87,000	87,000	26,100	60,900		
Capacitor, 50 KVA	set	1	5,500	5,500	1,600	3,900		
Power line	km	4.2	156,000	655,200	327,600	327,600		
Tax and Duty	L.S			560,000	560,000	-		
O/M facilities	unit	3	80,000	240,000	180,000	60,000		
Sub-total				<u>3,701,700</u>	<u>1,184,300</u>	<u>2,517,400</u>		
Total								
				<u>15,812,700</u>	<u>4,300,548</u>	<u>11,512,152</u>		

Table X-6 Cost Estimate for RID Gravity Irrigation

Description	Unit	Quantity	Total (₪)		Local (₪)		Foreign (₪)	
			Rate	Amount	Rate	Amount	Rate	Amount
Temporary Access	km	1	80,000	80,000	8,000	8,000	72,000	72,000
Excavation	cu.m	4,800	21	100,800	2	9,600	19	91,200
Fill by Excavation, 3 km	cu.m	1,900	48	91,200	5	9,500	43	81,700
Disposal, 0.5 km	cu.m	2,900	16	46,400	1	2,900	15	43,500
Lining Concrete	cu.m	260	1,800	468,000	1,079	280,540	721	187,460
RC, 220 kg/cm ²	cu.m	30	4,000	120,000	2,704	81,120	1,296	38,880
RC, pipe, ø1000	m	90	1,800	162,000	1,407	126,630	393	35,370
RC pipe, ø600	m	15	1,000	15,000	350	5,250	650	9,750
Riprap Pitching	cu.m	20	630	12,600	630	12,600	-	-
Slide Gate, 0.6x0.6m set	set	1	7,000	7,000	2,100	2,100	4,900	4,900
Miscellaneous	L-S			1,000		1,000		-
Total				1,104,000		539,240		564,760

Table X-7 Cost Estimate for Demonstration Farms

(1) Ban Ku Ra So Demonstration Farm (13.8 ha)

Tambon Lamphu, Amphoe Muang Narathiwat

Item	Unit	Quantity	Unit Rate (฿)		Amount (฿ x 10 ³)	
			L.C.	F.C.	L.C.	F.C.
<u>A. On-farm Work</u>						
1. Earth work						
- Excavation	cu.m	21.6	12.30	-	0.27	0.27
- Backfill	cu.m	14.7	10.00	-	0.15	0.15
- Embankment						
Compacted	cu.m	123.2	15.40	-	1.90	1.90
Ordinary	cu.m	74.4	10.00	-	0.74	0.74
2. Concrete work						
- Reinforced	cu.m	5.5	2,453.00	2,007.00	13.49	11.04
3. Timber work						
- 1/2" thickness	sq.m	0.9	84.00	36.00	0.08	0.03
- 2/3" thickness	sq.m	1.1	126.00	54.00	0.14	0.06
- 1" thickness	sq.m	2.8	168.00	72.00	0.47	0.20
					24.53	0.67

Item	Unit	Quantity	Unit Rate (₱)		Amount (₱ x 10 ³)		
			L.C.	F.C.	L.C.	F.C.	Total
4. Pipe work							
- RC pipe, ø200	pcs	7	144.00	216.00	1.01	1.51	2.52
- RC pipe, ø300	pcs	6	205.00	307.00	1.23	1.84	3.07
- RC pipe, ø600	pcs	3	344.00	516.00	1.03	1.55	2.58
5. Others							
- Sand bed	cu.m	0.3	50.00	50.00	0.01	0.02	0.03
- Crusher run	cu.m	0.9	144.00	216.00	0.13	0.19	0.32
Sub-total					20.65	16.44	37.09
B. <u>Water Source Work</u>							
- Deep well	unit	1			68.20	159.10	227.30
- Power line	km	1.8	78,000	78,000	140.40	140.40	280.80
Sub-total					208.60	299.50	508.10
Total					229.25	315.94	545.19

(2) Ban To Lang Demonstration Farm (23.5 ha)

Tambon Tanyongmilo, Amphoe Rangae

Item	Unit	Quantity	Unit Rate (฿)		Amount (฿ x 10 ³)				
			L.C.	F.C.	L.C.	F.C.	Total		
A. <u>On-farm Work</u>									
1. <u>Earth work</u>									
- Excavation	cu.m	4.7	12.30	-	12.30	0.06	-	0.06	0.06
- Backfill	cu.m	-	-	-	-	-	-	-	-
- Embankment									
Compacted	cu.m	283.5	15.40	-	15.40	4.37	-	4.37	4.37
Ordinary	cu.m	157.5	10.00	-	10.00	1.58	-	1.58	1.58
2. <u>Concrete work</u>									
- Reinforced	cu.m	3.1	2,453.00	2,007.00	4,460.00	7.61	6.22	13.83	13.83
3. <u>Timber work</u>									
- 1/2" thickness	sq.m	3.1	84.00	36.00	120.00	0.26	0.11	0.37	0.37
- 2/3" thickness	sq.m	3.5	126.00	54.00	180.00	0.44	0.19	0.63	0.63
- 1" thickness	sq.m	11.5	168.00	72.00	240.00	1.93	0.83	2.76	2.76

Item	Unit	Quantity	L.C.	Unit Rate (₱)		Amount (B x 10 ³)		
				F.C.	Total	L.C.	F.C.	Total
4. Pipe work								
- RC Pipe, ø200	pcs	13	144.00	216.00	360.00	1.87	2.81	4.68
- RC pipe, ø300	pcs	18	205.00	307.00	512.00	3.69	5.53	9.22
- RC Pipe, ø600	pcs	-	-	-	-	-	-	-
5. Others								
- Sand bed	cu.m	0.85	50.00	50.00	100.00	0.04	0.05	0.09
- Crusher run	cu.m	-	-	-	-	-	-	-
Sub-total						21.85	15.74	37.59
B. <u>Water Source Work</u>								
- Deep well	unit	1				68.20	159.10	227.30
- Power line	km	1.0	78,000	78,000	156,000	78.00	78.00	156.00
Sub-total						146.20	237.10	383.30
Total						168.05	252.84	420.89

(3) Ban Cha Ro Demonstration Farm (26.1 ha)

Tambon Phraiwan, Amphoe Tak Bai

Item	Unit	Quantity	Unit Rate (฿)			Amount (฿ x 10 ³)		
			L.C.	F.C.	Total	L.C.	F.C.	Total
<u>A. On-farm Work</u>								
<u>1. Earth work</u>								
- Excavation	cu.m	2,816.2	12.30	-	12.30	34.64	-	34.64
- Backfill	cu.m	148.4	10.00	-	10.00	1.48	-	1.48
- Embankment								
- Compacted	cu.m	531.4	15.40	-	15.40	8.18	-	8.18
- Ordinary	cu.m	571.7	10.00	-	10.00	5.72	-	5.72
<u>2. Concrete work</u>								
- Reinforced	cu.m	26.7	2,453.00	2,007.00	4,460.00	65.50	53.58	119.08
<u>3. Timber work</u>								
- 1/2" thickness	sq.m	4.4	84.00	36.00	120.00	0.37	0.16	0.53
- 2/3" thickness	sq.m	4.6	126.00	54.00	180.00	0.58	0.25	0.83
- 1" thickness	sq.m	16.3	168.00	72.00	240.00	2.74	1.17	3.91

Item	Unit	Quantity	Unit Rate (₹)			Amount (₹ x 10 ³)		
			L.C.	F.C.	Total	L.C.	F.C.	Total
4. Pipe work								
- RC pipe, ø200	pcs	16	144.00	216.00	360.00	2.30	3.46	5.76
- RC pipe, ø300	pcs	-	-	-	-	-	-	-
- RC pipe, ø600	pcs	37	344.00	516.00	860.00	12.73	19.09	31.82
5. Others								
- Sand bed	cu.m	-	-	-	-	-	-	-
- Crusher run	cu.m	5.7	144.00	216.00	360.00	0.82	1.23	2.05
Sub-total						<u>135.06</u>	<u>78.94</u>	<u>214.00</u>
B. <u>Water Source Work</u>								
- Deep well	unit	1				68.20	159.10	227.30
- Power line	km	2.5	78,000.00	78,000.00	156,000.00	195.00	195.00	390.00
Sub-total						<u>263.20</u>	<u>354.10</u>	<u>617.30</u>
Total						<u>398.26</u>	<u>433.04</u>	<u>831.30</u>

Table X-8 Cost Estimate for WJG Pumps and On-Farm Work

(A) On-Farm Work on Sample Areas

(1) Narathiwat Area (A = 134.87 ha)

Item	Unit	Quantity	Unit Rate (฿)		Amount (฿ x 10 ³)		
			L.C.	F.C.	L.C.	F.C.	Total
1. Earth work							
- Excavation	cu.m	7,939.2	12.30	-	97.65	-	97.65
- Backfill	cu.m	279.2	10.00	-	2.79	-	2.79
- Embankment							
Compacted	cu.m	3,307.8	15.40	-	50.94	-	50.94
Ordinary	cu.m	2,185.5	10.00	-	21.86	-	21.86
2. Concrete work							
- Reinforced	cu.m	128.1	2,453.00	2,007.00	322.32	263.72	586.04
3. Timber work							
- 1/2" thickness	sq.m	16.6	84.00	36.00	1.39	0.60	1.99
- 2/3" thickness	sq.m	18.7	126.00	54.00	2.36	1.01	3.37
- 1" thickness	sq.m	61.4	168.00	72.00	10.32	4.42	14.74

Item	Unit	Quantity	Unit Rate (₱)		Amount (₱ x 10 ³)		
			L.C.	F.C.	L.C.	F.C.	Total
4. Pipe work							
- RC pipe, ø200	pcs	71	144.00	216.00	10.22	15.34	25.56
- RC pipe, ø300	pcs	48	205.00	307.00	9.84	14.74	24.58
- RC pipe, ø600	pcs	60	344.00	516.00	20.64	30.96	51.60
5. Others							
- Sand bed	cu.m	2.3	50.00	50.00	0.11	0.12	0.23
- Crusher run	cu.m	16.0	144.00	216.00	2.30	3.46	5.76
- Miscellaneous	L.S				27.64	16.72	44.36
Total					580.38	351.09	931.47
				per ha	4.30	2.61	6.91

(2) Rangae Area (A = 87.56 ha)

Item	Unit	Quantity	Unit Rate (₱)		Amount (₱ x 10 ³)		
			L.C.	F.C.	L.C.	F.C.	Total
1. Earth work							
- Excavation	cu.m	69.5	12.30	-	0.85	-	0.85
- Backfill	cu.m	44.1	10.00	-	0.44	-	0.44
- Embankment							
Compacted	cu.m	1,522.5	15.40	-	23.45	-	23.45
Ordinary	cu.m	845.9	10.00	-	8.46	-	8.46
2. Concrete work							
- Reinforced	cu.m	19.8	2,453.00	2,007.00	53.72	43.95	97.67
3. Timber work							
- 1/2" thickness	sq.m	11.7	84.00	36.00	0.98	0.42	1.40
- 2/3" thickness	sq.m	12.8	126.00	54.00	1.61	0.69	2.30
- 1" thickness	sq.m	43.2	168.00	72.00	7.26	3.11	10.37

Item	Unit	Quantity	Unit Rate (₱)		Amount (₱ x 10 ³)		
			L.C.	F.C.	L.C.	F.C.	Total
4. Pipe work							
- RC pipe, ø200	pcs	47	144.00	216.00	6.77	10.15	16.92
- RC pipe, ø300	pcs	36	205.00	307.00	7.38	11.05	18.43
- RC pipe, ø600	pcs	9	344.00	516.00	3.10	4.64	7.74
5. Others							
- Cand bed	cu.m	1.7	50.00	50.00	0.08	0.09	0.17
- Crusher run	cu.m	2.8	144.00	216.00	0.40	0.61	1.01
- Miscellaneous	L.S				5.73	3.73	9.46
Total					<u>120.23</u>	<u>78.44</u>	<u>198.67</u>
				per ha	<u>1.37</u>	<u>0.90</u>	<u>2.27</u>

(3) Tak Bai Area (A = 132.01 ha)

Item	Unit	Quantity	Unit Rate (฿)		Amount (฿ x 10 ³)		
			L.C.	F.C.	L.C.	F.C.	Total
1. Earth work							
- Excavation	cu.m	10,514.1	12.30	-	129.32	-	129.32
- Backfill	cu.m	439.8	10.00	-	4.40	-	4.40
- Embankment							
Compacted	cu.m	3,833.5	15.40	-	59.04	-	59.04
Ordinary	cu.m	2,381.8	10.00	-	23.82	-	23.82
2. Concrete work							
- Reinforced	cu.m	172.0	2,453.00	2,007.00	429.52	351.43	780.95
3.1							
3. Timber work							
- 1/2" thickness	sq.m	19.8	84.00	36.00	1.67	0.71	2.38
- 2/3" thickness	sq.m	21.2	126.00	54.00	2.67	1.15	3.82
- 1" thickness	sq.m	73.0	168.00	72.00	12.26	5.26	17.52

Item	Unit	Quantity	Unit Rate (₱)			Amount (₱ x 10 ³)		
			L.C.	F.C.	Total	L.C.	F.C.	Total
4. Pipe work								
- RC pipe, ϕ200	pcs	75	144.00	216.00	360.00	10.80	16.20	27.00
- RX pipe, ϕ300	pcs	46	205.00	307.00	512.00	9.43	14.12	23.55
- RC pipe, ϕ600	pcs	95	344.00	516.00	860.00	32.68	49.02	81.70
5. Others								
- Sand bed	cu.m	2.3	50.00	50.00	100.00	0.11	0.12	0.23
- Crusher run	cu.m	18.0	144.00	216.00	360.00	2.59	3.89	6.48
- Miscellaneous	L.S					35.92	22.09	58.01
Total			<u>754.23</u>	<u>463.99</u>	<u>1,218.22</u>			
				<u>5.71</u>	<u>3.52</u>			<u>9.23</u>
				per ha				

(B) WUG Pumping Irrigation

(Unit = $\$ \times 10^3$)

	Unit	Quantity	Unit Rate	L.C.	F.C.		Total
					I.F.C.	D.F.C.	
(1) <u>Pump</u> (Self Priming Centrifugal Pump coupled with Gasoline Engine)							
	set	1	13.00	7.80	5.20	-	13.00
(2) <u>On-Farm Work</u>							
Sample (1)	ha	1	6.91	4.30	2.61	-	6.91
Sample (2)	ha	1	2.27	1.37	0.90	-	2.27
Sample (3)	ha	1	9.23	5.71	3.52	-	9.23
Average	ha	1	<u>6.14</u>	<u>3.79</u>	<u>2.35</u>	-	<u>6.14</u>
<u>Total Cost</u>							
Pump	set	193	13.00	1,505.40	1,003.60	-	2,509.00
On-Farm work	ha	3,830	6.14	14,515.60	9,000.60	-	23,516.20
Total				<u>16,021.00</u>	<u>10,004.20</u>	-	<u>26,025.20</u>

(C) RID Pumping and Gravity Irrigation Scheme

	Unit	Quantity	Unit Rate (₹ x 10 ⁵)	F.C.			Total
				L.C.	I.F.C.	D.F.C. (₹ x 10 ⁶)	
<u>(1) RID Pumping Irrigation Scheme</u>							
	ha	5,907	6.14	22.39	13.88	-	36.27
<u>(2) RID Gravity Irrigation Scheme</u>							
	ha	180	6.14	0.68	0.43	-	1.11
(3)	Total	6,087		23.07	14.31	-	37.38

Table X-9 Cost Estimate for O & M Equipment (RID)

No.	Unit Rate	Procurement Cost			By Fiscal Year					Annual Fuel & Repair Cost	
		L.C.+ I.F.C	D.F.C. Total	($\text{₹} \times 10^3$)	5	6	7	8	9	Unit Rate	Total
1	450	68	382	450	450	-	-	-	-	66	66
80	21	252	1,428	1,680	504	-	399	399	378	7	560
2	200	60	340	400	200	-	200	-	-	40	80
3	210	94	536	630	210	-	210	210	-	92	276
1	1,200	180	1,020	1,200	-	-	1,200	-	-	215	215
1	710	106	604	710	-	-	710	-	-	172	172
1	100	15	85	100	-	-	100	-	-	47	47
3	60	27	153	180	-	-	180	-	-	17	51
1	180	27	153	180	-	-	180	-	-	16	16
3	85	38	217	255	-	-	255	-	-	11	33
3	70	31	179	210	-	-	210	-	-	10	30
1	120	18	102	120	-	-	120	-	-	12	12
1	25	4	21	25	-	-	25	-	-	5	5
1	250	37	213	250	-	-	250	-	-	21	21
1	19	3	16	19	-	-	19	-	-	2	2
2	21	6	36	42	-	-	42	-	-	2	4
1	16	2	14	16	16	-	-	-	-	5	5

	Procurement Cost			By Fiscal Year					Annual Fuel & Repair Cost	
	No.	Unit Rate	L.C.+ I.F.C. Total	5	6	7	8	9	Unit Rate	Total
Electric Hand Drill, 1/2"	1	71	11 60 71	71	-	-	-	-	4	4
Electric Bench Drill, 1/2"	1	141	21 120 141	141	-	-	-	-	10	10
Electric Portable Grinder	1	92	14 78 92	92	-	-	-	-	6	6
Electric Bench Grinder W/Brush	1	260	39 221 260	260	-	-	-	-	18	18
Hydraulic Jack, 10 ton	1	71	11 60 71	71	-	-	-	-	5	5
Hydraulic Jack, 5 ton	2	47	14 80 94	94	-	-	-	-	3	6
Chain Hoist, 5 ton	1	470	70 400 470	470	-	-	-	-	28	28
Hand Tool Set	1	260	39 221 260	260	-	-	-	-	18	18
Electric System Tester	1	13	2 11 13	13	-	-	-	-	1	1
Battery Charger	1	20	3 17 20	20	-	-	-	-	1	1
Battery Tester	1	11	2 9 11	11	-	-	-	-	1	1
Equipment for Office		L.S.	59 336 395	395	-	-	-	-	L.S.	20
Equipment for Communication		L.S.	38 216 254	-	-	254	-	-	L.S.	38
Speed Boat	1	30	4 26 30	30	-	-	-	-	6	6
Miscellaneous		L.S.	53 298 351	180	-	171	-	-	L.S.	18
TOTAL			<u>1,348 7,652 9,000 3,488</u>	<u>4,525 609 378</u>					<u>1,774</u>	

Cost Summary

(unit = $\text{€} \times 10^3$)

	<u>L.C.</u>	<u>I.F.C.</u>	<u>D.F.C.</u>	<u>Total</u>
Procurement	1,033	315	7,652	9,000
Annual Fuel & Repair	204	62	1,508	1,774

Table X-10 Cost Estimate for Land Acquisition

(1) Tidal Regulators

	<u>Quantity</u> (ha)	<u>Unit Rate</u> (฿)	<u>Amount</u> (฿ x 10 ³)
<u>UTR</u>			
Swamp & Hilly Area	40	62,500	2,500
<u>LTR</u>			
Additional for Tract & Access Road	16	62,500	1,000
<u>Bang Nara Water Storage</u>	-		-
Total	<u>56</u>		<u>3,500</u>

(2) Irrigation and Drainage System

A. Drainage Improvement

A.1. Ban Lo Mo	2.8	60,000	168.00
A.2. Khlong Ku Ra Po	10.3	60,000	618.00
A.3. Khlong Na Ko	7.2	60,000	432.00
A.4. Khlong To Che			2,244.00
A.4.1. To Che	12.0	60,000	720.00
A.4.2. Lu Bo Manang	18.7	60,000	1,122.00
A.4.3. Khok Niang	6.7	60,000	402.00
A.5. Khlong Chang			2,442.00
A.5.1. Chang	16.3	60,000	978.00
A.5.2. Ba Ngo Du Dong	17.5	60,000	1,050.00
A.5.3. Ku Rong Ya Ma	6.9	60,000	414.00
A.6. Ban Sala Pradu	1.4	60,000	84.00
A.7. Khlong Sala Mai	8.0	60,000	480.00
Sub-total (A)			<u>6,468.00</u>

	<u>Quantity</u> (ha)	<u>Unit Rate</u> (฿)	<u>Amount</u> (B x 10 ³)
B. <u>RID-Pumping Irrigation</u>			
B.1. Pu Ta	5.6	60,000	336.00
B.2. Khao Kong	21.6	60,000	1,296.00
B.3. Du Song	23.7	60,000	1,422.00
B.4. Tan Yong Mat	21.5	60,000	1,290.00
B.5. Khok Ti Te	38.9	60,000	2,334.00
B.6. Maru Bo	11.1	60,000	666.00
B.7. Sala Mai	13.6	60,000	816.00
B.8. Ko Sawat	18.6	60,000	1,116.00
B.9. Phru Kap Daeng	16.7	60,000	1,002.00
B.10. Ku Cham	10.7	60,000	642.00
Sub-total (B)			<u>10,920.00</u>
C. <u>RID-Gravity Irrigation</u>	1.7	60,000	<u>102.00</u>
Total			<u>17,490.00</u>

Table X-11 Cost Estimate for Consulting Services

(1) <u>Total Cost</u>		
A.	<u>Foreign cost</u>	<u>₪ x 10³</u>
A.1.	Remuneration	
	Foreign 120 M/M x ₪350,000	42,000
A.2.	Out-of-Pocket Expenses	
	Travel: 25 air fares x ₪45,000	1,125
	Equipment, supplies and miscellaneous	1,263
	Sub-total	<u>44,388</u>
B.	<u>Local cost</u>	
B.1.	Remuneration	
	Local 178 M/M x ₪95,000	16,910
B.2.	Per Diem	
	Foreign 120 M/M x ₪35,000	4,200
	Local 178 M/M x 0.5 x ₪18,000	1,602
B.3.	Communications and Miscellaneous	
	5 years x 12 months x ₪15,000	900
	Sub-total	<u>23,612</u>
	<u>Total Base Cost (A + B)</u>	<u>68,000</u>

(2) Cost by Fiscal Year

(Unit: ₪ x 10⁶)

	Thai Fiscal Year						Total						
	2	3	4	5	6								
	<u>F.C.</u>	<u>L.C.</u>	<u>F.C.</u>	<u>L.C.</u>	<u>F.C.</u>	<u>L.C.</u>	<u>F.C.</u>	<u>L.C.</u>	<u>Total</u>				
Remuneration													
Foreign	15.40	-	10.85	-	9.45	-	3.50	-	2.80	-	42.00	-	42.00
Local	-	3.52	-	4.75	-	5.89	-	1.43	-	1.32	-	16.91	16.91
Air fares	0.27	-	0.23	-	0.36	-	0.18	-	0.09	-	1.13	-	1.13
Per Diem													
Foreign	-	1.54	-	1.09	-	0.94	-	0.35	-	0.28	-	4.20	4.20
Local	-	0.33	-	0.45	-	0.56	-	0.13	-	0.13	-	1.60	1.60
Communications and misc.	-	0.18	-	0.18	-	0.18	-	0.18	-	0.18	-	0.90	0.90
Equipment, supplies and misc.	0.66	-	0.15	-	0.15	-	0.15	-	0.15	-	1.26	-	1.26
Total Base Cost	<u>16.33</u>	<u>5.57</u>	<u>11.23</u>	<u>6.47</u>	<u>9.96</u>	<u>7.57</u>	<u>3.83</u>	<u>2.09</u>	<u>3.04</u>	<u>1.91</u>	<u>44.39</u>	<u>23.61</u>	<u>68.00</u>

Table X-12 Cost Estimate for Overseas Training

(1) Total Cost

One team in a year : 3 men x 2 months = 6 man-months

For five years : 6 man-months x 5 years = 30 man-months

A. <u>Foreign Cost</u>	<u>฿ x 10³</u>
A.1. Overseas Travel	
15 airfares x ฿ 300,000	4,500
A.2. Overseas Allowances	
30 man-months x ฿ 55,000	1,650
A.3. Payment to Host Institutions	
30 man-months x ฿ 60,000	1,800
Sub-total	<u>7,950</u>
 B. <u>Local Cost</u>	
Local Handling Expenses	
15 men x ฿ 10,000	150
Sub-total	<u>150</u>
Total Base Cost (A + B)	<u><u>8,100</u></u>

(2) Cost by Fiscal Year

(Unit = ฿ x 10⁶)

Thai Fiscal Year	2		3		4		5		6		Total		
	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	Total
Overseas Travel	0.90	-	0.90	-	0.90	-	0.90	-	0.90	-	4.50	-	4.50
Overseas Allowance	0.33	-	0.33	-	0.33	-	0.33	-	0.33	-	1.65	-	1.65
Payment to Overseas	0.36	-	0.36	-	0.36	-	0.36	-	0.36	-	1.80	-	1.80
Local Handling	-	0.03	-	0.03	-	0.03	-	0.03	-	0.03	-	0.15	0.15
TOTAL	<u>1.59</u>	<u>0.03</u>	<u>1.59</u>	<u>0.03</u>	<u>1.59</u>	<u>0.03</u>	<u>1.59</u>	<u>0.03</u>	<u>1.59</u>	<u>0.03</u>	<u>7.95</u>	<u>0.15</u>	<u>8.10</u>

Table X-13 Cost Estimate for Engineering and Administration

(1) Building during Construction

	Quan- Unit Unit Rate ($\$$)	Amount		By Fiscal Year													
		F.C.	L.C.	Total	1	2	3	4	5	6	7	8	9	10	11		
		-----($\$ \times 10^3$)-----															
Project Office (RID and Special Cooperative Unit)	sq.m 500	4,000	500	1,500	2,000	2,000	-	-	-	-	-	-	-	-	-	-	-
Residence (PC7 ~ 8) Unit	4	360,000	360	1,080	1,440	360	1,080	-	-	-	-	-	-	-	-	-	-
Residence (PC5 ~ 6) Unit	10	300,000	750	2,250	3,000	2,100	900	-	-	-	-	-	-	-	-	-	-
Dormitory	sq.m 200	2,500	125	375	500	500	-	-	-	-	-	-	-	-	-	-	-
Garage and Ware- house	sq.m 100	700	18	52	70	70	-	-	-	-	-	-	-	-	-	-	-
Workshop	sq.m 50	2,500	31	94	125	-	125	-	-	-	-	-	-	-	-	-	-
<u>Sub-total</u>			1,784	5,351	7,135	5,030	2,105	-	-	-	-	-	-	-	-	-	-
O & M (Initial cost x 5%)			866	2,598	3,464	-	252	356	357	357	357	357	357	357	357	357	357
<u>Total</u>			(25%) 2,650	(75%) 7,949	10,599	-	-	-	-	-	-	-	-	-	-	-	-

(2) Equipment during Construction

A. No. of Vehicles	By Fiscal Year															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Station wagon, 4 x 4	-	2	4	4	5	5	5	5	2	2	-	-	-	-	-	-
Motor bicycle, 125CC	-	17	19	22	26	29	35	40	35	28	21	13	9	5	3	2
Pick-up truck	-	2	3	3	3	3	4	4	4	4	3	2	2	1	1	1
Flat bed truck	-	2	6	6	6	6	6	6	6	6	6	-	-	-	-	-
Station Motor wagon																
Pick-up truck																
Flat bed truck																
RID	3	11	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Special Task Force Unit	2	12	1	1	1	1	1	1	1	1	1	1	1	1	1	1
DOAE	-	17	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Total	5	40	4	4	4	4	4	4	4	4	4	4	4	4	4	4

B. Cost	No.	Unit	Amount	Unit Annual Cost	By Fiscal Year													
					1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Rate	L.C.	F.C.	Total Cost	(x10 ⁶)													
B.1 Vehicles																		
Station Wagon, 4x4	5	450	338 1,912 2,250	-	0.90	0.90	-	0.45	-	-	-	-	-	-	-	-	-	
Motor vicycle, 125 cc	40	21	126 714 840	66	0.13	0.26	0.26	0.33	0.33	0.33	0.33	0.13	0.13	-	-	-	-	
Pick-up truck	4	200	120 680 800	7	0.12	0.13	0.15	0.18	0.20	0.20	0.25	0.28	0.25	0.20	0.15	0.09	0.06	0.04
Flat bed truck, 4 ton	6	210	189 1,071 1,260	40	0.08	0.12	0.12	0.12	0.12	0.12	0.16	0.16	0.16	0.16	0.12	0.08	0.08	0.04
<u>Sub-total</u>			773 4,377 5,150	92	0.18	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	

* / --- Cost for fuel and repair per vehicle per year.

Unit	Amount		Unit Annual Cost	By Fiscal Year																
	No.	Rate		L.C.	F.C.	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14

(Bx10³)

B.2 For Survey and Office

Auto level	2	12	4	20	24																	
Theodolite	2	35	10	60	70																	
Minor survey equipment	L.S.	3	17	20																		
Electric typewriter	2	70	21	119	140																	
Manual typewriter	4	25	15	85	100	90																
Blue print copy machine	1	135	20	115	135	(5%)																
Photo copy machine	2	90	27	153	180																	
Drafting equipment	2	15	1	26	30																	
Communication equipment	L.S.	150	850	1,000																		
Speed boat	1	30	4	26	30																	
Miscellaneous	L.S.	11	60	71																		
Sub-total				269	1,531	1,800																
Total (B.1 + B.2)				1,042	5,908	6,950																

(Unit : ₪ x 10³)

B.3 Total Cost

	L.C.	F.C.	Total
Procurement	1,042	5,908	6,950
O & M	1,750	9,920	11,670
Total	2,792	15,828	18,620

(3) Pre-Engineering Work

1) Total Cost

A. Topographical mapping survey

- Aerial-photo based, with a scale of 1 : 4,000 and a contour interval of 0.25 m.

$$9,980 \text{ ha} \times (1+0.3) \div 0.16 \text{ rai/ha} \times \text{฿}12/\text{rai} = \underline{\text{฿}973 \times 10^3}$$

B. Topographical survey

B.1 Profile and cross-sections for canals.

Drainage : 74.4 km

Irrigation : 151.9 km

$$226.3 \text{ km} \times \text{฿}4,000/\text{km} = \underline{\text{฿}905 \times 10^3}$$

B.2 Cadastral survey for on-farm design.

$$9,980 \text{ ha} \div 0.16 \text{ rai/ha} \times \text{฿}7/\text{rai} = \underline{\text{฿}437 \times 10^3}$$

C. Geological survey

- Hand auger test for 5 m depth.

- One hole per 200 m of canal.

$$226.3 \text{ km}/200 \text{ m} \times 5 \text{ m} \times \text{฿}120 = \underline{\text{฿}679 \times 10^3}$$

$$\text{Total (A+B + C)} = \underline{\underline{\text{฿}2,994 \times 10^3}}$$

(L.C. only)

2) Cost by Fiscal Year

<u>Thai Fiscal Year</u>	(Unit : ฿ x 10 ³)								<u>Total</u>
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	
Topographical Mapping	486	487	-	-	-	-	-	-	973
Profile and Cross-Sections	-	-	301	302	302	-	-	-	905
Cadastral	-	-	73	73	73	73	73	72	437
Hand auger test	-	-	170	170	170	169	-	-	679
<u>Total</u>	<u>486</u>	<u>487</u>	<u>544</u>	<u>545</u>	<u>545</u>	<u>242</u>	<u>73</u>	<u>72</u>	<u>2,994</u>

(4) Administration during Construction Stage

1) RID and Special Task Force Unit

A. Staffing (Only for key staff)

Thai Fiscal Year	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
<u>A.1 RID Project Office</u>										
Project Manager (PC8)		1	1	1	1	1	1	1		
Chief, Engineering Service (PC7)		1	1	1	1	1	1	1		
Chief, Construction (PC7)		1	1	1	1	1	1	1		
Chief, Mechanical (PC6)		1	1	1	1	1	1	1		
Chief, On-farm (PC6)		1	1	1	1	1	1	1	1	1
Technical Assistant (PC5)		7	8	9	9	9	9	8	3	3
<u>A.2 Special Task Force Unit</u>										
Chief (PC7)	1	1	1	1	1	1	1	1	1	1
Community Organizer (PC6)	4	4	4	4	4	4	4	2	2	2
Agri. Extension Officer (PC6)	1	1	1	1	1	1	1	1	1	
Irrigation Engineer (PC6)	1	1	1	1	1	1	1	1	1	
Cooperative Promo- tion Offi. (PC6)	1	1	1	1	1	1	1	1	1	
Technical Assis- tant (PC5)	3	3	4	5	6	7	7	4	3	2

B. Cost by Fiscal Year

B.1 Remuneration for Key Staff

(Unit: $\text{₦} \times 10^3$)

Year	2	3	4	5	6	7	8	9	10	11
PC8 ($\text{₦}12,500/$ month)	-	1 150	1 150	1 150	1 150	1 150	1 150	1 150	-	-
PC7 ($\text{₦}11,500/$ month)	1 138	3 414	3 414	3 414	3 414	3 414	3 414	3 414	1 138	1 138
PC6 ($\text{₦}9,500/$ month)	7 798	9 1,026	9 1,026	9 1,026	9 1,026	9 1,026	9 1,026	7 798	6 684	3 342
PC5 ($\text{₦}6,500/$ month)	3 234	10 780	12 936	14 1,092	15 1,170	16 1,248	16 1,248	12 936	6 468	5 390
Sub- <u>total</u>	<u>1,170</u>	<u>2,370</u>	<u>2,526</u>	<u>2,682</u>	<u>2,760</u>	<u>2,838</u>	<u>2,838</u>	<u>2,298</u>	<u>1,290</u>	<u>870</u>

B.2 Remuneration for Supporting Staff

B.1 x 0.55

B.3 Overhead Cost

(B.1 + B.2) x 0.30

B.4 Total Cost

(Unit : $\text{₦} \times 10^3$)

Year	2	3	4	5	6	7	8	9	10	11
	2,363	4,787	5,102	5,418	5,575	5,733	5,733	4,642	2,606	1,757

C. Total Cost

$\text{₦}43,716 \times 10^3$ (L.C. only)

2) DOAE (for Agricultural Extension)

A. Staffing

Year	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Extension Worker (PC4)	1	2	5	7	12	17	17	17	16	13	9	5	3	2

B. Cost by Fiscal Year

(Unit : ₪ x 10³)

B.1 Remuneration (₪4,500/month)	54	108	270	378	648	918	918	918	864	702	486	270	162	108
B.2 Overhead Cost (B.1 x 0.30)														
B.3 Cost by Fiscal Year	70	140	351	491	842	1,193	1,193	1,193	1,123	913	632	351	211	140

C. Total Cost

₪8,843 x 10³
(L.C. only)

Table-14 Cost for Tidal Regulators by Fiscal Year

(Unit: $\text{B}\times 10^6$)

	Year 3				Year 4			
	L.C.	I.F.C.	D.F.C.	Total	L.C.	I.F.C.	D.F.C.	Total
(1) Total cost								
<u>UTR</u>	<u>42.05</u>	<u>40.13</u>	<u>71.40</u>	<u>153.58</u>	<u>44.73</u>	<u>14.64</u>	<u>53.91</u>	<u>113.28</u>
Civil work	42.05	40.13	1.11	83.29	14.67	10.66	20.03	45.36
Gate work	-	-	70.29	70.29	30.06	3.98	33.88	67.92
<u>LTR</u>	<u>16.89</u>	<u>18.00</u>	<u>20.66</u>	<u>55.55</u>	<u>14.25</u>	<u>5.54</u>	<u>16.13</u>	<u>35.92</u>
Civil work	16.89	18.00	0.28	35.17	4.88	3.95	5.13	13.96
Gate work	-	-	20.38	20.38	9.37	1.59	11.00	21.96
Total	<u>58.94</u>	<u>58.13</u>	<u>92.06</u>	<u>209.13</u>	<u>58.98</u>	<u>20.18</u>	<u>70.04</u>	<u>149.20</u>
	year 3				Year 4			
	L.C.	I.F.C.	D.F.C.	Total	L.C.	I.F.C.	D.F.C.	Total
(2) Civil work cost								
<u>UTR</u>								
1) Temporary work	2.08	1.07	-	3.15	0.77	0.57	2.75	4.90
2) Regulator body & connection channel	37.83	35.90	1.11	74.84	2.83	3.38	17.28	23.49
3) Sapi Yo closure dam	1.57	0.93	-	2.50	-	-	-	-
4) Bang Nara closure dam	-	-	-	-	10.04	5.50	-	15.54
5) Road	0.57	2.23	-	2.80	0.06	0.25	-	0.31
6) O&M facilities	-	-	-	-	0.97	0.96	-	1.93
Total	<u>42.05</u>	<u>40.13</u>	<u>1.11</u>	<u>83.29</u>	<u>14.67</u>	<u>10.66</u>	<u>20.03</u>	<u>45.36</u>
<u>LTR</u>								
1) Temporary work	0.95	0.48	-	1.43	0.54	0.29	0.91	1.74
2) Regulator body & connection channel	15.08	15.20	0.28	30.56	1.08	1.49	4.22	6.79
3) Bang Nara closure dam	-	-	-	-	2.13	1.22	-	3.35
4) Road	0.86	2.32	-	3.18	0.10	0.25	-	0.35
5) O&M facilities	-	-	-	-	1.03	0.70	-	1.73
Total	<u>16.89</u>	<u>18.00</u>	<u>0.28</u>	<u>35.17</u>	<u>4.88</u>	<u>3.95</u>	<u>5.13</u>	<u>13.96</u>

Table X-15 Cost for Irrigation and Drainage System by Fiscal Year

(Unit: Bx10⁶)

	Thal Fiscal Year			5			6			7			8			9			Total			
	L.C.	F.C.	T.	L.C.	F.C.	T.	L.C.	F.C.	T.	L.C.	F.C.	T.	L.C.	F.C.	T.	L.C.	F.C.	T.	L.C.	F.C.	T.	
Stage I																						
- Drainage																						
- Ban Lo Mo	5.62	1.8.40	16.63	10.88	0.3.91	30.88	-	-	-	-	-	-	-	-	-	-	-	-	1.24.49	16.50	0.6.52	47.51
- Ban Sala Pradu																						
- K. Sala Mai																						
- K. Sala Mai																						
- K. Sala Mai																						
- K. Sala Mai																						
2 Irrigation																						
- Pu Ta	1.27	1.8.40	16.63	8.43	0.3.91	24.94	-	-	-	-	-	-	-	-	-	-	-	-	1.21.00	14.05	0.6.52	41.57
- Sala Mai	2.05	1.1.11	3.21	1.91	0.1.25	4.82	-	-	-	-	-	-	-	-	-	-	-	-	1.2.77	3.18	0.2.08	8.03
- Ko Sawat	2.30	1.2.91	6.03	3.08	0.1.60	9.04	-	-	-	-	-	-	-	-	-	-	-	-	1.7.27	5.13	0.2.57	15.07
- Ko Sawat																						
- Ko Sawat																						
- Ko Sawat																						
Stage II																						
A. First Package																						
- A.1 Drainage																						
- K. Ku Ra Po																						
- K. Ku Ra Po																						
- K. Ku Ra Po																						
A.2 Irrigation																						
- Khao kong																						
- Phru Kap Daeng																						
- Ku Cham																						

Table X-15 Cost for Irrigation and Drainage System by Fiscal Year (Unit: \$x10⁶)

	4		5		7		8		9		Total	
	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.
B. Second Package	-	-	-	-	-	-	-	-	-	-	-	-
B.1 Drainage	-	-	-	-	-	-	-	-	-	-	-	-
-K. Na Ko	-	-	-	-	-	-	-	-	-	-	-	-
-K. To Che (To Che)	-	-	-	-	-	-	-	-	-	-	-	-
-K. Chang (K. Chang)	-	-	-	-	-	-	-	-	-	-	-	-
-K. To Che (Khok Niang)	-	-	-	-	-	-	-	-	-	-	-	-
B.2 Irrigation	-	-	-	-	-	-	-	-	-	-	-	-
-Du Song	-	-	-	-	-	-	-	-	-	-	-	-
-Khok Ti Te	-	-	-	-	-	-	-	-	-	-	-	-
C. Third Package	-	-	-	-	-	-	-	-	-	-	-	-
C.1. Drainage	-	-	-	-	-	-	-	-	-	-	-	-
-K. To Che (Lu Bo Manang)	-	-	-	-	-	-	-	-	-	-	-	-
-K. Chang (Ba Ngo Du Dung)	-	-	-	-	-	-	-	-	-	-	-	-
-K. Chang (Ku Rong Ya Ma)	-	-	-	-	-	-	-	-	-	-	-	-
C.2. Irrigation	-	-	-	-	-	-	-	-	-	-	-	-
-Tan Yong Mat	-	-	-	-	-	-	-	-	-	-	-	-
-Maru Bo	-	-	-	-	-	-	-	-	-	-	-	-
-RID Gravity Irrigation	-	-	-	-	-	-	-	-	-	-	-	-
Total	5.62	16.63	19.85	16.73	58.57	11.77	36.09	22.70	62.61	40.22	9.58	105.54
	I.8.40	I.31.38	I.19.96	I.19.96	I.33.67	I.33.67	I.55.74	I.55.74	I.55.74	I.21.63	I.21.63	I.170.78
	D.2.61	D.7.34	D.4.36	D.4.36	D.6.24	D.6.24	D.9.58	D.9.58	D.9.58	D.3.93	D.3.93	43.03
												117.63
												34.06
												322.47

Table X-16 Cost for WUG Pumps and On-Farm Work by Fiscal Year

(Unit: ₪x10⁶)

(1) WUG Pumps

<u>Year</u>	<u>Construction (ha)</u>	<u>L.C.</u>	<u>I.F.C.</u>	<u>Total</u>
4	762	3.18	2.00	5.18
5	1,544	6.45	4.04	10.49
6	1,143	4.78	2.99	7.77
7	381	1.61	0.98	2.59
<u>Total</u>	<u>3,830</u>	<u>16.02</u>	<u>10.01</u>	<u>26.03</u>

(2) RID Pumps and Gravity

1) Stage I

<u>Year</u>	<u>Construction (ha)</u>	<u>L.C.</u>	<u>I.F.C.</u>	<u>Total</u>
5	494	1.87	1.16	3.03
6	494	1.87	1.16	3.03
7	252	0.96	0.59	1.55
<u>Total</u>	<u>1,240</u>	<u>4.70</u>	<u>2.91</u>	<u>7.61</u>

2) Stage II

<u>Year</u>	<u>Construction (ha)</u>	<u>L.C.</u>	<u>I.F.C.</u>	<u>Total</u>
5	-	-	-	-
6	454	1.72	1.07	2.79
7	456	1.73	1.07	2.80
8	997	3.78	2.34	6.12
9	1,496	5.67	3.52	9.19
10	1,096	4.15	2.58	6.73
11	348	1.32	0.82	2.14
<u>Total</u>	<u>4,847</u>	<u>18.37</u>	<u>11.40</u>	<u>29.77</u>

Table X-17 Cost Estimate for Operation and Maintenance

(A) Salaries and Wages per Year at Full Development (RID)

	No. of Personnel			Annual Salary (\$x10 ³)	Annual Total Salary (\$x10 ³)
	UTR & LTR	WUG Pumps & Checks	RID-Irrigation & Drainage		
Project Engineer				150	150
Water Master	1	1	1	50	150
Zoneman	-	4	6	40	400
Common Irrigator	-	-	38	30	1,140
Gate Operator	8	17	-	30	450
Pump Operator	-	-	33	30	990
Mechanic	-	-	2	40	80
Electrician	-	-	2	40	80
Casual Employee				L.S.	360
Sub-total					<u>3,800</u>
Supporting Staff		10%			380

Total 4,130

(B) Pumping Motive Power Cost

B.1 WUG Pumping Irrigation Scheme

$$P_m = \frac{0.222 \times H \times Q \times (1 + \alpha)}{\eta_p \times \eta}$$

P_m : Engine output (Ps)

H : Total head (m)

Q : Discharge (1.65 cu.m per min.)

α : Allowance (0.2)

η_p : Pump efficiency (0.65)

η : Transmission efficiency (1.00)

Annual lifting volume = 7,268 cu.m per ha x 20 ha
= 145,360 cu.m

Annual pump operation hour
= 145,360 cu.m \div 1.65 cu.m per min.
= 1,468 hrs.

Gasoline consumption = 0.15 l per ps per hour

Unit price of gasoline = ₱ 11.7 per litre

(1) Case with an average lifting head

$H = EL + 2.0 \text{ m} - EL + 0.4 \text{ m} = 1.6 \text{ m}$
 $P_m = 1.08 \text{ ps}$
Annual cost = ₱ 2,782 per unit or
₱ 139 per ha

(2) Case with the highest head

$H = EL + 5.0 \text{ m} - EL + 0.4 \text{ m} = 4.6 \text{ m}$
 $P_s = 3.11 \text{ ps}$
Annual cost = ₱ 8,012 per unit or
₱ 400 per ha

B.2 RID Pumping Irrigation Scheme

$$P_m = \frac{0.163 \times H \times Q \times (1 + \alpha)}{\eta_p \times \eta}$$

P_m: Motor output (kW)

H : Total head (m)

Q : Discharge (cu.m per min.)

α : Allowance (0.2)

η_p: Pump efficiency (0.75)

η : Transmission efficiency (1.00)

Annual lifting water volume: 7,268 cu.m per ha

Electricity charge to PEA : Ø1.12 per kWh

Scheme	Service Area (ha)	Annual Lifting Water Volume (10 ³ cu.m)	Pump Capacity (cu.m/hr)	Annual Pump Opera. Hour (Hr)	Motor Size (kW)	Required Power (kWh)	Annual Power Cost	
							Total (Øx10 ³)	Per Ha (Ø)
Pu Ta	230	1,672	1,152	1,451	37	53,687	60.13	261
Khao Kong	560	4,070	2,772	1,468	90	132,120	147.97	264
Du Song	880	6,396	4,392	1,456	320	465,920	521.83	593
Tan Yong Mat	1,090	7,922	5,400	1,467	110	161,370	180.73	166
Khok Ti Te U.	610	4,433	3,024	1,463	264	386,232	432.58	709
- do - L.	510	3,707	2,520	1,471	150	220,650	247.13	484
Maru Bo	470	3,416	2,340	1,460	150	219,000	245.28	522
Sala Mai	490	3,561	2,448	1,455	110	160,050	179.26	366
Ko Sawat	520	3,779	2,592	1,458	74	107,892	120.84	232
Phru Kap Daeng	380	2,762	1,872	1,475	60	88,500	99.12	261
Ku Cham	190	1,381	936	1,475	37	54,575	61.12	322
Total	5,930				1,402	2,049,996	2,295.99	(387)

(C) Annual Cost for O & M at Full Development

(Unit: $\text{P} \times 10^3$)

(1) Salaries and Wages	4,130
(2) Equipment: Fuel and Repair	1,774
(3) Material Supplies ^{1/}	1,373
(4) RID Pump Electricity	2,296
(5) <u>General Expenditure^{2/}</u>	<u>287</u>
Total	<u>9,860</u>

1/ ... UTR and LTR (Civil cost x 0.1%)
 $\text{P}358.33 \times 10^6 \times 0.1\% = \text{P} 358 \times 10^3$

Others (Civil cost x 0.3%)
 $\text{P}338.30 \times 10^6 \times 0.3\% = \text{P}1,015 \times 10^3$

2/ ... [(1) + (2) + (3) + (4)] x 3%

(D) Annual Cost for O & M of the WUG Pumps at Full Development

(Unit: $\text{P} \times 10^3$)

(1) Repair ^{1/}	125
(2) <u>Gasoline^{2/}</u>	<u>532</u>
Total	<u>657</u>

1/ ... Installation cost x 5%
 $= \text{P}2,509 \times 10^3 \times 5\% = \text{P}125 \times 10^3$

2/ ... $\text{P}139$ per ha x 3,830 ha = $\text{P}532 \times 10^3$

(E) O & M Cost by Fiscal Year

(Unit: ₱x10³)

	5	6	7	8	9	10	11	12	13	14	15	16	17
	Thai Fiscal Year												
(A) By RID													
(1) Salaries and Wages	1,652	2,065	2,478	3,304	3,717	4,130	4,130	4,130	4,130	4,130	4,130	4,130	4,130
(2) Equipment: Fuel & Repair	355	444	532	710	887	1,064	1,419	1,774	1,774	1,774	1,774	1,774	1,774
(3) Material Supplies	206	275	343	412	549	686	824	1,098	1,373	1,373	1,373	1,373	1,373
(4) Pump Electricity	-	115	238	459	712	115	1,561	1,906	2,112	2,227	2,273	2,296	2,296
(5) General Expenditures	86	86	144	201	258	287	287	287	287	287	287	287	287
Total	2,299	2,985	3,727	5,086	6,123	6,282	8,221	9,195	9,676	9,791	9,837	9,860	9,860

(B) By WUG Pumps

(1) Repair	6	24	49	74	96	111	120	124	125	125	125	125	125
(2) Gasoline	27	101	207	314	410	473	511	527	532	532	532	532	532
Total	33	125	256	388	506	584	631	651	657	657	657	657	657
Total (A + B)	2,332	3,110	3,983	5,474	6,629	6,866	8,852	9,846	10,333	10,448	10,494	10,517	10,517

(F) Annual Cost for O & M (Stage I)

(1) At full development (Unit: $\text{₦} \times 10^3$)

1) Salaries and Wages	1,627
2) Equipment : Fuel and Repair	643
3) Material Supplies	548 ^{1/}
4) RID Pump Electricity	360
5) General Expenditure	95 ^{2/}
<u>Total</u>	<u>3,274</u>

$$\underline{1/} \dots \text{₦ } 358.33 \times 10^6 \times 0.1\% + \text{₦ } 63.34 \times 10^6 \times 0.3\%$$

$$\underline{2/} \dots [(1) + (2) + (3) + (4)] \times 3\%$$

(2) Annual Cost (Unit: $\text{₦} \times 10^6$)

	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>
RID	0.90	1.80	1.96	2.29	2.61	2.94	3.17	3.27	3.27
WUG Pump	0.03	0.13	0.26	0.39	0.51	0.58	0.63	0.65	0.66
<u>Total</u>	<u>0.93</u>	<u>1.93</u>	<u>2.22</u>	<u>2.68</u>	<u>3.12</u>	<u>3.52</u>	<u>3.80</u>	<u>3.92</u>	<u>3.93</u>

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XI-1-2. Financial Analysis

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XI-1. Project Economics

Table XI-1-1. Summary of Financial and Economic Prices

Items		Unit	Financial	Economic
<u>Input</u>				
1. Seed	a) Paddy, Local	฿/kg	3.5	4.3
	b) Paddy, HYV, RD13	฿/kg	3.7	4.6
	c) Paddy, HYV, RD7	฿/kg	3.7	4.6
	d) Rubber (Cover crop, etc.)	฿/ha	143.0	132.0
	e) Sweet Corn	฿/kg	20.0	21.0
	f) Muangbean	฿/kg	16.0	16.7
	g) Groundnut	฿/kg	16.0	16.7
	h) Tomato	฿/kg	700.0	730.0
	i) Chili	฿/kg	500.0	520.0
	j) Long Kong	฿/kg	9.0	9.4
	k) Forage	฿/kg	10.0	10.4
2. Fertilizer				
	a) 16-20-0	฿/kg	6.8	6.6
	b) 12-24-12	฿/kg	7.6	7.4
	c) Amm. Sulphate	฿/kg	4.5	4.3
	d) C.I.R.P.	฿/kg	3.1	3.0
	e) 18-10-6	฿/kg	6.2	6.0
	f) 18-4-5	฿/kg	5.1	4.9
	g) 15-7-8	฿/kg	5.2	5.0
	h) Urea	฿/kg	10.3	9.9
	i) Superphosphate	฿/kg	7.2	7.0
	j) Potassium Chloride	฿/kg	5.5	5.3
	k) 15-15-15	฿/kg	7.1	6.9
	l) 13-13-21	฿/kg	6.9	6.7
3. Agro-chemical		฿/ha	200	192
4. Lime Dust		฿/ton	275	251
5. Rhizobium		฿/kg	10.0	9.6
6. Labor		฿/man-day	60	55
<u>Output</u>				
1. Crops				
	a) Paddy, Local	฿/ton	3,472	4,317
	b) Paddy, HYV, RD13	฿/ton	3,688	4,585
	c) Paddy, HYV, RD7	฿/ton	3,688	4,585
	d) Rubber (USS)	฿/ton	17,579	25,891
	e) Sweet Corn	฿/ton	2,337	2,447
	f) Mungbean	฿/ton	7,459	7,744
	g) Groundnut	฿/ton	7,566	7,835
	h) Tomato	฿/ton	7,716	8,012
	i) Chili	฿/ton	4,072	4,228
	j) Longkong	฿/ton	44,000	46,000
	k) Forage	฿/ton	188	195
2. Fish		฿/kg	17.0	18.0

Table XI-1-2. Price of Fish

Name of Fish	Price (P/kg)	
	Farm Gate	Market
<u>Fresh Water Fish</u>		
Snake Head Fish	19	26
Cat Fish	23	33
Browing Fish	9	13
Climbing Perch	9	13
Murrel	15	25
Eel	25	-
<u>Marine Water Fish</u>		
White Mullet	15	14
Indian Mackerel	12	12
Big Eye Fish	11	9
Sheet Fish	15	9
Oh Fish	16	15
Green Tail	8	12
Pampano	10	9
Tulong Fish	10	9
Green Back	10	12
Indo Pacific	20	14
Bonito	15	17

Note : Sample Size : Farmers = 36, Headman = 12
Source : Farm Economic Survey

Table XI-1-3. Crop Budget Per Hectare
- Present & Without -
(Unit:Baht/ha)

Item	Unit Price(฿)		Qty.	Photo-sensitive, Local		Qty.	Photo-sensitive ved		Qty.	Rubber	
	Fin.	Eco.		Fin.	Eco.		Fin.	Eco.		Fin.	Eco.
1. Yield (t/ha)	-	-	1.3	-	-	1.7	-	-	0.71	-	-
2. Farm Gate Price (฿/ton)	-	-	-	3,472	4,317	-	3,472	4,317	-	17,579	25,891
3. Gross Production Value (฿/ton)	-	-	-	4,514	5,612	-	5,902	7,339	-	12,481	18,383
4. Production Cost											
a) Seed - Paddy, Local	3.5/kg	4.3/kg	28kg	98	120	-	-	-	-	-	-
- Paddy, Improved	3.7/kg	4.6/kg	-	-	-	28kg	104	129	-	-	-
- Rubber(Cover Crop and Input Materials)	-	-	-	-	-	-	-	-	-	143	132
b) Fertilizer											
- 16-20-0	6.8/kg	6.6/kg	64kg	435	422	73kg	496	482	-	-	-
- 12-24-12	7.6/kg	7.4/kg	-	-	-	-	-	-	-	-	-
- Amm. Sulphate	4.5/kg	4.3/kg	32kg	144	138	35kg	158	151	-	-	-
- C.I.R.P.	3.1/kg	3.0/kg	-	-	-	-	-	-	15kg	47	45
- 18-10-6	6.2/kg	6.0/kg	-	-	-	-	-	-	18kg	112	108
- 18-4-5	5.1/kg	4.9/kg	-	-	-	-	-	-	17kg	87	83
- 15-7-8	5.2/kg	5.0/kg	-	-	-	-	-	-	141kg	733	705
- Agro-Chemical	200/ha	192/ha	-	50	48	-	50	48	-	-	-
Sub-Total	-	-	-	727	728	-	808	810	-	1,122	1,073
d) Labor Requirement	60/day	55/day	55days	330	3,025	65days	390	3,575	179 days	3,282	9,845
Sub-Total	-	-	-	1,057	3,753	-	1,198	4,385	-	4,404	10,918
e) Miscellaneous Cost(depreciation, interest, repair, fuel, rent, tax, etc)											
Total Production Cost				1,258	3,941		1,433	4,604		4,997	11,464
NPV				3,950	1,671		5,205	2,735		7,484	6,919
NPV Ratio				(75.8)	(29.8)		(78.4)	(37.3)		(60.0)	(37.6)

Table XI-I-6. Crop Budget Per Hectare
- With Project - (Unit: Baht/ha)

Item	Unit Price (฿)		Groundnut		Tomato		Chili	
	Fin.	Eco.	Qty.	Fin.	Eco.	Qty.	Fin.	Eco.
1. Yield (t/ha)	-	-	1.8	-	-	15.0	-	12.0
2. Farm Gate Price (฿/ton)	-	-	-	7,566	7,835	-	7,716	8,012
3. Gross Production Value (฿/ton)	-	-	-	13,619	14,103	-	115,740	120,180
4. Production Cost								
a) Seed - Groundnut	16.0/kg	16.7/kg	125kg	2,000	2,088	-	-	-
- Tomato	700/kg	730/kg	-	-	-	0.4kg	280	292
- Chili	500/kg	520/kg	-	-	-	-	-	-
b) Fertilizer								
- 12-24-12	7.6/kg	7.4/kg	160kg	1,216	1,184	-	-	-
- 15-15-15	7.1/kg	6.9/kg	-	-	-	350kg	2,485	2,415
c) Agro-Chemical	-	-	-	200	192	-	700	672
d) Rhizobium	10/kg	9.6/kg	8.0kg	80	77	-	-	-
Sub-Total	-	-	-	3,496	3,541	-	3,465	3,379
e) Labor Requirement	60/day	46/day	110days	-	5,060	430days	-	19,780
Sub-Total	-	-	-	3,496	8,601	-	3,465	23,159
f) Miscellaneous Cost (depreciation, interest, repair, fuel, rent, etc)	-	-	-	505	430	-	1,463	1,158
Total Production Cost				4,001	9,031		4,928	24,317
5. NPV				9,618	5,072		110,812	95,863
NPV Ratio				(70.6)	(36.0)		(95.7)	(79.8)
								(90.6)
								(48.7)
								26,037
								4,602
								24,797
								1,240
								2,139
								600
								208
								21,850
								3,026
								1,576
								2,947
								4,228
								48,864
								50,736

Table XI-1-7. Crop Budget Per Hectare
 - With Project - (Unit:Baht/ha)

Item	Unit Price (฿)		Longkong			Forage		
	Fin.	Eco.	Qty.	Fin.	Eco.	Qty.	Fin.	Eco.
1. Yield (t/ha)	-	-	4.0	-	-	40.0	-	-
2. Farm Gate Price (฿/ton)	-	-	-	44,000	46,000	-	188	195
3. Gross Production Value (฿/ton)	-	-	-	176,000	184,000	-	7,520	7,800
4. Production Cost								
a) Seed - Longkong	9.0/kg	9.4/kg	100kg	900	940	-	-	-
- Forage	10.0/kg	10.4/kg	-	-	-	3kg	30	31
b) Fertilizer								
- 12-24-12	7.6/kg	7.4/kg	-	-	-	-	-	-
- 13-13-21	6.9/kg	6.7/kg	-	-	-	-	-	-
- 15-15-15	7.1/kg	6.9/kg	120kg	852	828	-	-	-
- Urea	10.3/kg	9.9/kg	-	-	-	40kg	412	396
- Superphosphate	7.2/kg	7.0/kg	-	-	-	25kg	180	175
c) Agro-Chemical	-	-	-	314	307	-	-	-
Sub-Total	-	-	-	2,066	2,075	-	622	602
d) Labor Requirement	60/day	50/day	500days	-	25,000	36days	-	1,800
Sub-Total	-	-	-	2,066	27,075	-	622	2,402
e) Miscellaneous Cost(depreciation, interest, repair, fuel, rent, etc)	-	-	-	1,603	1,354	-	139	120
Total Production Cost				3,669	29,429		761	2,522
5. NPV				172,331	154,571		6,759	5,278
NPV Ratio				(97.9)	(84.0)		(89.9)	(67.7)

Table XI-1-8. Price Structure of Paddy

Cost Items	Unit	Constant 1986 Price		
		Financial (CF)	Economic	
Projected 1995 Export Price	1) US\$/t	342	-	342
Thai, 5% Broken F.O.B.	฿/t	8,995	-	8,995
Grade Differential	2) %	95	-	95
Weighted Average Export Price	฿/t	8,545	-	8,545
Port Charges	฿/t	150	0.92	138
Rice Premium	3) ฿/t	600	-	-
Export Duty	4) ฿/t	214	-	-
Business and Municipal Tax	5) ฿/t	9	-	-
Exporter's Margin	6) ฿/t	427	0.92	393
Wholesaler's Margin	7) ฿/t	214	0.92	197
Transport & Handling to Bangkok	฿/t	480	0.87	418
Ex-mill price of rice	฿/t	6,451	-	7,399
Ex-mill price of paddy	8) ฿/t	4,774	-	5,475
Milling Tax	9) ฿/t	119	-	-
Miller's Margin	10) ฿/t	668	0.92	615
Import Price of paddy at mill	฿/t	3,987	-	4,860
Merchant's margin	11) ฿/t	299	0.92	275
Farm Gate Price	฿/t	3,688	-	4,585

- Notes: 1) June 1985 World Bank Commodity Price Forecasts for 1995 price in 1983 constant US dollar adjusted to 1986 constant dollar using MUV index of 104.6 at 1 US\$ = 26.3 Baht
- 2) The weighted average export price adjusted for quality is assumed to be 95 percent of the price of 5 percent broken rice
- 3) Based on OAE Bulletin, Nov. 1985
- 4) 2.5 percent of weighted average export price
- 5) 0.1 percent of weighted average export price
- 6) 5 percent of weighted average export price
- 7) 2.5 percent of weighted average export price
- 8) Milling ratio of 66 percent plus the value of by-product; bran, etc, for which 8 percent has been added
- 9) 2.5 percent of ex-mill price of paddy
- 10) 14 percent of ex-mill price of paddy before tax
- 11) 7.5 percent of import price of paddy at mill, including transport, handling and profit

Table XI-1-9. Price Structure of Rubber

Cost Items	Unit	Constant 1986 Price	
		Financial (CF)	Economic
Projected 1995 Export Price			
RSS. No. 1., in bales,			
Spot New York	1) US\$/t	1,360 -	1,360
Ocean Freight and Insurance	US\$/t	170 -	170
F.O.B. Songkhla	US\$/t	1,190 -	1,190
	฿/t	31,297 -	31,297
Grade Differential (RSS3)	2) %	98 -	98
Weighted Average Export Price	฿/t	30,671 -	30,671
Port Charges	฿/t	150 0.92	138
Custom Gate Duty	฿/t	20 -	-
Estimated Cess	3) ฿/t	2,117 -	-
Estimated Export Tax	4) ฿/t	7,048 -	-
Exporter's/Processor's Margin	5) ฿/t	307 0.92	282
Packing	฿/t	450 0.92	414
Smoking	฿/t	270 0.92	248
Transport & Warehousing	฿/t	300 0.87	261
Middle Dealer's Margin	6) ฿/t	61 0.92	56
Village Price for RSS3 (DRC)	฿/t	17,948 -	29,272
Equivalent			
Local Transport	฿/t	150 0.87	131
Village Dealer's Margin	7) ฿/t	31 0.92	29
Farm Gate Price RSS3 (DRC)	8) ฿/t	19,767 -	29,112
Equivalent			
Farm Gate Price Differential	฿/t	19,108 -	28,142
(Sheet and Scrap - DRC)			
Farm Gate (USS and Scrap)	9) ฿/t	17,579 -	25,891

- Notes: 1) June 1985 World Bank Commodity Price Forecasts for 1995 price in 1983 constant US dollar adjusted to 1986 constant dollar using MUV index of 104.6 at 1 US\$ = 26.3 Baht
- 2) Based on ratio of RSS3 to RSS1 in exporters' prices averaged over period 1974-1982 (Songkhla Lake Basin Planning Study, NESDB)
- 3) ฿/50 per ton for assumed gazetted price less than ฿10,000 per ton plus 10 percent of prices above ฿10,000 per ton
- 4) Using RRC formula (Gazetted price - ฿5,800) 0.4 - ฿2,900
- 5) 1 percent of weighted average export price
- 6) 0.2 percent of weighted average export price
- 7) 0.1 percent of weighted average export price
- 8) Assumed 95 percent sheet and 5 percent scrap with scrap price being one third of sheet
- 9) Adjusted for moisture content assumed to be 8 percent

Table XI-1-10. Price Structure of Groundnuts

Cost Items	Unit	Constant 1986 Price		
		Financial (CF)	Economic	
Projected 1995 World Market Price 1)	US\$/t	628	-	628
Ocean Freight and Insurance	US\$/t	50	-	50
Export Price F.O.B., Bangkok	US\$/t	578	-	578
	฿/t	15,201	-	15,201
Exporter's Margin 2)	฿/t	1,140	0.92	1,049
Wholesale Price	฿/t	14,061	-	14,152
Transport and Handling, from Bangkok to Project Area	฿/t	480	0.87	418
Price of shelled nuts	฿/t	13,581	-	13,734
Price of unshelled nuts 3)	฿/t	9,507	-	9,614
Cost of shelling 4)	฿/t	475	0.92	437
Shelling factory's margin 5)	฿/t	475	0.92	437
Transport to factory	฿/t	150	0.87	131
Input price at factory	฿/t	8,407	-	8,609
Middleman's margin 6)	฿/t	841	0.92	774
Farmgate price of dried groundnut	฿/t	7,566	-	7,835

- Notes: 1) June 1982 World Bank Commodity Price Forecasts (shelled ground nuts, C.I.F. Europe), for 1985 price in 1981 constant US dollar using MUV index of 1.003 at 1 US\$ = 26.3 Baht
- 2) 10 percent of F.O.B. Bangkok Price minus export duty of 2.5 percent of the same price
- 3) The shelling ratio of bunch groundnut of 70 percent
- 4) Five percent of the price of unshelled nuts
- 5) Five percent of the price of unshelled nuts
- 6) Ten percent of the input price of groundnuts at factory

Table XI-1-11. Price Structure of Corn

Cost Items	Unit	Constant 1986 Price		
		Financial (CF)	Economic	
Projected 1995 Export Price of Maize (US) No.2 yellow F.O.B. Gulf Ports 1)	US\$/t	118	-	118
Corresponding F.O.B. Price Bangkok 2)	US\$/t	130	-	130
	฿/t	3,419	-	3,419
Exporter's Margin 3)	฿/t	342	0.92	315
Wholesale price	฿/t	3,077	-	3,104
Transport and Handling from Project Area to Bangkok	฿/t	480	0.87	418
Retail Price	฿/t	2,597	-	2,686
Merchant's Margin 4)	฿/t	260	0.92	239
Farm Gate Price	฿/t	2,337	-	2,447

- Notes: 1) June 1985 World Bank Commodity Price Forecasts for 1995 price in 1983 constant US Dollar adjusted to 1986 constant US Dollar using MUV index of 104.6 at 1 US\$ = 26.3 Baht
- 2) Ten percent above the projected 1995 Export Price which is considered to reflect the long-term relationship between the F.O.B. Bangkok and F.O.B. Gulf Ports
- 3) Ten percent of F.O.B. Bangkok Price
- 4) Ten percent of the retail price

Table XI-1-12. Price Structure of Urea, 46 percent N

Cost Items	Unit	Constant 1986 Price		
		Financial (CF)	Economic	
Projected 1995 World Market Price, F.O.B. Europe 1)	US\$/t	251	-	251
Ocean, Freight and Insurance	US\$/t	50	-	50
Import Price, C.I.F. Bangkok	US\$/t	301	-	301
	฿/t	7,916	-	7,916
Tax 2)	฿/t	158	0	0
Importer's/Wholesaler's Margin 3)	฿/t	792	0.92	729
Transportation from Bangkok to Project Area	฿/t	480	0.87	418
Wholesaler's Price	฿/t	9,346	-	9,063
Retailer's Margin 4)	฿/t	935	0.92	860
Farm Gate Price	฿/t	10,281	-	9923
Farm Gate Price of Nutrient	฿/t	22,350	-	21,572

- Note: 1) June 1985 World Bank Commodity Price Forecasts for 1995 price in 1983 constant US dollar adjusted to 1986 constant dollar using MUV index of 104.6 at 1 US\$ = 26.3 Baht
- 2) Two percent of C.I.F. Bangkok Price for business and municipal tax
- 3) Ten percent of C.I.F. Bangkok Price including handling charge and profit
- 4) Ten percent of wholesaler's price including local transportation, handling charge, and profit

Table XI-1-13. Price Structure of TSP, 45 Percent P₂O₅

Cost Items	Unit	Constant 1986 Price		
		Financial (CF)	Economic	
Projected 1995 World Market Price, 1) F.O.B. Europe	US\$/t	157	-	157
Ocean, Freight and Insurance	US\$/t	50	-	50
Import Price, C.I.F. Bangkok	US\$/t	207	-	207
	฿/t	5,444	-	5,444
Tax 2)	฿/t	109	0	0
Importer's/Wholesaler's Margin 3)	฿/t	544	0.92	500
Transportation from Bangkok to Project Area	฿/t	480	0.87	418
Wholesaler's Price	฿/t	6,577	-	6,362
Retailer's Margin 4)	฿/t	658	0.92	605
Farm Gate Price	฿/t	7,235	-	6,967
Farm Gate Price of Nutrient	฿/t	16,078	-	15,482

- Note: 1) June 1985 World Bank Commodity Price Forecasts for 1995 price in 1983 constant US dollar adjusted to 1986 constant dollar using MUV index of 104.6 at 1 US\$ = 26.3 Baht
- 2) Two percent of C.I.F. Bangkok Price for business and municipal tax
- 3) Ten percent of C.I.F. Bangkok Price including handling charge and profit
- 4) Ten percent of wholesaler's price including local transportation, handling charge, and profit

Table XI-1-14. Price Structure of Potassium Chloride, 60 percent K₂O

Cost Items	Unit	Constant 1986 Price		
		Financial (CF)	Economic	
Projected 1995 World Market Price, 1) F.O.B. Europe	US\$/t	103	-	103
Ocean, Freight and Insurance	US\$/t	50	-	50
Import Price, C.I.F. Bangkok	US\$/t	153	-	153
	฿/t	4,024	-	4,024
Tax 2)	฿/t	80	0	0
Importer's/Wholesaler's Margin 3)	฿/t	402	0.92	370
Transportation from Bangkok to Project Area	฿/t	480	0.87	418
Wholesaler's Price	฿/t	4,986	-	4,812
Retailer's Margin 4)	฿/t	499	0.92	459
Farm Gate Price	฿/t	5,485	-	5,271
Farm Gate Price of Nutrient	฿/t	9,142	-	8,785

- Note: 1) June 1985 World Bank Commodity Price Forecasts for 1995 price in 1983 constant US dollar adjusted to 1986 constant dollar using MUV index of 104.6 at 1 US\$ = 26.3 Baht
- 2) Two percent of C.I.F. Bangkok Price for business and municipal tax
- 3) Ten percent of C.I.F. Bangkok Price including handling charge and profit
- 4) Ten percent of wholesaler's price including local transportation, handling charge, and profit

Table XI-1-15. Aquaculture Benefit in the Water Storage

(Economic, With Project)

Area of Reservoir (ha)	Unit Yield (kg/ha)	Average ^{*2} Price		G.P.V. (฿/ha)	Production Cost (฿/ha)	Total N.P.V. ('000฿)
		(฿/kg)				
1,390	150	18		2,700	988	2,380

Note: *1: Surface Area of Full Water Level

*2: Source: Farm Economic Survey (Table XI-1-2)

Table XI-1-16. Production Cost of Aquaculture

(With Project)

Cost Item	Unit Price		Qty	Cost	
	Fin.	Eco.		Fin.	Eco.
	(฿)	(฿)		(฿/ha)	(฿/ha)
(1) Fish fry per year ^{*1}	0.1	0.092	450	45	41
(2) Labor, man-days 9 months x 4 times x 0.5 persons	60	50	18	1,080	900
(3) Others (depreciation for boat, net, other fishing gadget)	-	-	-	56	47
(4) Total				1,181	988

Note: *1...Supplied from Pattani and Phattalung Breeding Center at 1 ฿/10 fries. About one third of fries is expected to grow up for a year weighing 1 kg/fish on average

Table XI-1-17. Construction Conversion Factors

Cost Item	Financial Cost (%)				Economic Cost (%)				Weighted Conversion Factor
	Local Cost		Foreign Cost		Local Cost		Foreign Cost		
	Transfer Payment	Unskilled Labor	Others Cost	Foreign Cost	Transfer Payment	Unskilled Labor	Others Cost	Foreign Cost	
<u>A. Major Work</u>									
A.1. Tidal Regulators	11	1	21	67	-	1	19	67	0.87
A.2. Acidic Water Flow Checks	4	2	47	47	-	2	43	47	0.92
A.3. Irrigation and Drainage	6	2	29	64	-	2	27	64	0.93
B. Demonstration Farms	-	20	24	56	-	15	22	56	0.93
<u>C. WUG Pumps and On-Farm Work</u>									
C.1. WUG Pumps	-	18	44	38	-	14	40	38	0.92
C.2. RID Pumps and Gravity	-	20	42	38	-	15	39	38	0.92
D. O&M Equipment	10	-	1	89	-	-	1	89	0.90
E. Land Acquisition	-	-	100	-	-	-	92	-	0.92
F. Consultants and Training	-	-	31	69	-	-	29	69	0.92
G. Engineering and Administration	1	1	86	12	-	1	79	12	0.92

Table XI-1-18 PROJECT COST AND BENEFITS / ORIGINAL CASE

(UNIT : MILLION BAHT

YEAR	PROJECT COST		TOTAL	BENEFITS	RETURN	8 %		10 %		12 %	
	CAPITAL	O & M				(COST)	(BENEFITS)	(COST)	(BENEFITS)	(COST)	(BENEFITS)
1 1987	4.680	0.0	4.680	0.0	-4.680	4.680	0.0	4.680	0.0	4.680	0.0
2 1988	34.630	0.0	34.630	0.0	-34.630	29.690	0.0	28.620	0.0	27.607	0.0
3 1989	253.330	0.0	253.330	0.0	-253.330	201.102	0.0	190.331	0.0	180.315	0.0
4 1990	198.400	0.0	198.400	0.0	-198.400	145.830	0.0	135.510	0.0	126.087	0.0
5 1991	87.850	2.530	90.380	3.260	-86.920	62.736	3.580	57.237	3.266	52.305	2.985
6 1992	69.260	3.110	72.370	19.500	-52.870	45.606	12.288	40.851	11.007	36.665	9.879
7 1993	86.110	3.980	90.090	39.270	-50.820	52.567	22.914	46.231	20.152	40.752	17.764
8 1994	122.620	5.470	128.090	55.380	-72.710	69.203	29.920	59.755	25.835	51.734	22.367
9 1995	58.030	6.630	64.660	75.390	-10.730	32.346	37.714	27.422	31.973	29.517	27.186
10 1996	11.230	6.870	18.100	102.000	83.900	8.384	47.246	6.978	39.326	5.828	32.841
11 1997	5.620	8.850	14.470	122.640	108.170	6.206	52.599	5.072	42.985	4.160	35.256
12 1998	0.900	9.830	10.730	134.640	123.890	4.269	53.468	3.425	42.901	2.759	34.559
13 1999	0.620	10.330	10.950	139.560	128.610	4.026	51.316	3.172	40.426	2.509	31.984
14 2000	0.350	10.450	10.800	142.090	131.290	3.677	48.376	2.844	37.417	2.210	29.075
15 2001	0.210	10.490	10.700	143.160	132.460	3.373	45.130	2.582	34.272	1.955	26.155
16 2002	0.140	13.020	13.160	143.460	130.300	2.841	41.875	2.064	31.222	1.477	23.402
17 2003	0.0	10.520	10.520	143.460	132.940	2.843	38.773	1.891	28.383	1.532	20.894
18 2004	0.0	10.520	10.520	143.460	132.940	2.633	35.901	1.688	25.803	1.368	18.656
19 2005	0.0	10.520	10.520	143.460	132.940	2.438	33.242	1.420	23.457	1.221	16.657
20 2006	0.0	10.520	10.520	143.460	132.940	2.257	30.779	1.164	21.325	0.991	14.872
21 2007	0.0	10.520	10.520	143.460	132.940	2.090	28.300	0.922	19.386	0.774	13.279
22 2008	0.0	10.520	10.520	143.460	132.940	1.792	26.388	0.711	17.634	0.669	11.856
23 2009	0.0	10.520	10.520	143.460	132.940	1.659	24.434	0.668	16.022	0.619	10.586
24 2010	0.0	10.520	10.520	143.460	132.940	1.536	20.948	0.619	13.241	0.571	9.452
25 2011	0.0	10.520	10.520	143.460	132.940	1.420	19.396	0.571	12.037	0.530	8.439
26 2012	0.0	13.020	13.020	143.460	130.440	1.219	17.960	0.530	10.943	0.493	7.535
27 2013	0.0	10.520	10.520	143.460	132.940	1.129	16.629	0.493	9.948	0.440	6.727
28 2014	0.0	10.520	10.520	143.460	132.940	1.053	15.397	0.440	9.044	0.393	6.007
29 2015	0.0	18.650	18.650	143.460	124.810	0.896	14.257	0.393	8.222	0.363	5.363
30 2016	0.0	18.950	18.950	143.460	124.510	0.896	13.201	0.363	7.474	0.329	4.788
31 2017	0.0	10.520	10.520	143.460	132.940	0.815	12.223	0.329	6.795	0.280	4.275
32 2018	0.0	10.520	10.520	143.460	132.940	0.744	11.318	0.280	6.177	0.242	3.817
33 2019	0.0	24.040	24.040	143.460	119.420	0.684	10.479	0.242	5.616	0.200	3.408
34 2020	0.0	18.380	18.380	143.460	125.080	0.619	9.703	0.200	5.105	0.199	3.043
35 2021	0.0	10.520	10.520	143.460	132.940	0.565	8.984	0.199	4.641	0.159	2.717
36 2022	0.0	13.020	13.020	143.460	130.440	0.515	8.319	0.159	4.219	0.159	2.426
37 2023	0.0	10.520	10.520	143.460	132.940	0.470	7.703	0.144	3.836	0.144	2.166
38 2024	0.0	10.520	10.520	143.460	132.940	0.426	7.132	0.127	3.487	0.127	1.934
39 2025	0.0	10.520	10.520	143.460	132.940	0.384	6.604	0.113	3.170	0.113	1.727
40 2026	0.0	10.520	10.520	143.460	132.940	0.344	6.115	0.101	2.882	0.101	1.542
41 2027	0.0	10.520	10.520	143.460	132.940	0.306	5.662	0.090	2.620	0.090	1.229
42 2028	0.0	10.520	10.520	143.460	132.940	0.270	5.242	0.080	2.382	0.080	1.097
43 2029	0.0	10.520	10.520	143.460	132.940	0.236	4.854	0.072	2.165	0.072	0.980
44 2030	0.0	10.520	10.520	143.460	132.940	0.204	4.494	0.064	1.968	0.064	0.875
45 2031	0.0	10.520	10.520	143.460	130.440	0.174	4.178	0.057	1.789	0.057	0.781
46 2032	0.0	13.020	13.020	143.460	132.940	0.149	3.853	0.051	1.627	0.051	0.697
47 2033	0.0	10.520	10.520	143.460	132.940	0.126	3.568	0.046	1.479	0.046	0.623
48 2034	0.0	10.520	10.520	143.460	132.940	0.104	3.304	0.041	1.344	0.041	0.556
49 2035	0.0	10.520	10.520	143.460	132.940	0.084	3.059	0.036	1.222	0.036	0.496
50 2036	0.0	10.520	10.520	143.460	132.940	0.066	2.841	0.031	1.117	0.031	0.444
TOTAL	935.980	494.500	1430.480	5999.090	4569.510	716.908	931.632	641.670	660.778	580.225	484.330

BENEFIT COST RATIO BY DISCOUNT RATE (8/C) = 1.30 (8%), 1.03 (10%), 0.83 (12%)
INTERNAL RATE OF RETURN (IRR) = 10.3 %

Table XI-1-19 PROJECT COST AND BENEFITS , STAGE-I

YEAR	PROJECT COST		RETURN	PRESENT WORTH VALUE BY DISCOUNT RATE		10 %	
	CAPITAL	O & M		(BENEFITS)	(COST)	(BENEFITS)	(COST)
1 1987	2,720	0.0	-2,720	2,720	0.0	2,720	0.0
2 1988	22,300	0.0	-22,300	19,119	0.0	18,430	0.0
3 1989	232,820	0.0	-232,820	195,481	0.0	174,921	0.0
4 1990	180,050	0.0	-180,050	142,617	0.0	122,977	0.0
5 1991	53,310	0.930	-48,980	40,531	3,931	33,679	3,266
6 1992	20,430	1.930	-2,560	15,552	13,747	12,452	11,007
7 1993	14,590	2.220	19,010	11,246	23,889	20,959	18,433
8 1994	8,160	2.980	36,600	6,801	29,765	25,650	22,131
9 1995	4,350	3.120	45,430	4,422	31,312	26,463	22,435
10 1996	2,720	3.520	51,690	3,484	32,348	26,833	22,335
11 1997	2,180	3.800	54,650	3,150	31,939	26,003	21,251
12 1998	0.540	3.920	57,000	2,217	30,544	24,407	19,583
13 1999	0.0	3.930	61,700	1,845	28,928	22,687	17,872
14 2000	0.0	3.930	61,940	1,738	27,396	21,088	16,311
15 2001	0.0	3.930	61,940	1,640	25,846	19,926	14,828
16 2002	0.0	6.430	55,510	2,531	24,383	18,080	13,480
17 2003	0.0	3.930	58,010	1,459	23,003	16,741	12,255
18 2004	0.0	3.930	61,940	1,377	21,701	15,901	11,141
19 2005	0.0	3.930	61,940	1,299	20,472	14,352	10,128
20 2006	0.0	3.930	61,940	1,225	19,314	13,289	9,207
21 2007	0.0	3.930	61,940	1,156	18,220	12,305	8,370
22 2008	0.0	3.930	61,940	1,091	17,189	11,393	7,609
23 2009	0.0	3.930	61,940	1,029	16,216	10,549	6,917
24 2010	0.0	3.930	61,940	0,971	15,298	9,768	6,289
25 2011	0.0	3.930	61,940	0,916	14,432	9,044	5,717
26 2012	0.0	6.430	55,510	1,415	13,615	8,375	5,197
27 2013	0.0	3.930	61,940	0,815	12,845	7,754	4,725
28 2014	0.0	3.930	61,940	0,769	12,118	7,180	4,295
29 2015	0.0	3.930	61,940	0,725	11,432	6,648	3,905
30 2016	0.0	12.060	49,800	2,100	10,785	6,136	3,550
31 2017	0.0	3.930	61,940	0,646	10,174	5,700	3,227
32 2018	0.0	3.930	61,940	0,609	9,598	5,277	2,934
33 2019	0.0	3.930	61,940	0,575	9,055	4,886	2,667
34 2020	0.0	3.930	61,940	0,542	8,543	4,525	2,425
35 2021	0.0	3.930	61,940	0,511	8,059	4,189	2,204
36 2022	0.0	6.430	55,510	0,789	7,603	3,879	2,004
37 2023	0.0	3.930	61,940	0,455	7,172	3,592	1,822
38 2024	0.0	3.930	61,940	0,429	6,767	3,336	1,656
39 2025	0.0	3.930	61,940	0,405	6,383	3,019	1,505
40 2026	0.0	3.930	61,940	0,382	6,022	2,851	1,369
41 2027	0.0	3.930	61,940	0,360	5,681	2,640	1,244
42 2028	0.0	3.930	61,940	0,340	5,360	2,444	1,131
43 2029	0.0	3.930	61,940	0,321	5,056	2,263	1,028
44 2030	0.0	3.930	61,940	0,303	4,770	2,096	0,935
45 2031	0.0	3.930	61,940	0,286	4,500	1,941	0,850
46 2032	0.0	6.430	61,940	0,441	4,245	1,797	0,773
47 2033	0.0	3.930	61,940	0,254	4,005	1,664	0,702
48 2034	0.0	3.930	61,940	0,240	3,778	1,540	0,638
49 2035	0.0	3.930	61,940	0,226	3,565	1,426	0,580
50 2036	0.0	3.930	61,940	0,213	3,363	1,321	0,528
TOTAL	543,910	189,590	1960,960	480,491	694,367	457,037	332,459

BENEFIT COST RATIO BY DISCOUNT RATE (B/C) = 1.05 (8%) , 0.93 (10%)
 INTERNAL RATE OF RETURN (IRR) = 8.4 %

Table XI-1-20 PROJECT COST AND BENEFITS - SENSITIVITY ANALYSIS, CASE 1
10% INCREASE OF CONSTRUCTION COST

(UNIT : MILLION BAHT)

YEAR	PROJECT COST		RETURN	6 %		10 %		12 %		
	CAPITAL	0 & M		TOTAL	BENEFITS (COST)	BENEFITS (COST)	BENEFITS (COST)	BENEFITS (COST)		
1 1987	5.148	0.0	5.148	0.0	5.148	0.0	5.148	0.0	5.148	0.0
2 1988	38.093	0.0	38.093	0.0	32.659	0.0	31.482	0.0	30.368	0.0
3 1989	278.663	0.0	278.663	0.0	221.212	0.0	209.364	0.0	198.347	0.0
4 1990	218.240	0.0	218.240	0.0	160.413	0.0	149.061	0.0	138.696	0.0
5 1991	98.835	2.330	101.165	5.260	68.851	3.580	62.816	3.266	57.404	2.985
6 1992	76.186	3.110	79.296	19.500	49.970	12.288	44.761	11.007	40.174	9.879
7 1993	54.721	3.980	58.701	39.270	57.591	22.914	50.649	20.152	44.647	17.764
8 1994	34.882	5.470	40.352	55.380	75.828	29.520	65.476	25.835	56.686	22.367
9 1995	63.833	6.630	70.463	75.390	35.249	37.714	29.863	31.973	27.186	27.186
10 1996	12.353	6.870	19.223	102.000	8.904	47.246	7.411	39.326	6.189	32.841
11 1997	6.182	8.850	15.032	122.640	6.447	52.599	5.269	42.985	4.321	35.256
12 1998	0.990	9.850	10.840	123.600	4.305	53.468	3.454	42.901	2.782	34.559
13 1999	0.682	10.330	11.012	128.546	4.049	51.316	3.190	40.426	2.524	31.984
14 2000	0.385	10.450	10.835	142.090	3.689	48.376	2.863	37.417	2.217	29.075
15 2001	0.231	10.490	10.721	132.439	3.380	45.130	2.567	34.272	1.959	26.155
16 2002	0.154	13.020	13.174	130.286	3.845	41.875	2.867	31.222	2.149	23.402
17 2003	0.0	10.520	10.520	143.460	2.843	38.773	2.081	28.383	1.532	20.894
18 2004	0.0	10.520	10.520	143.460	2.833	35.901	1.892	25.805	1.368	18.656
19 2005	0.0	10.520	10.520	143.460	2.438	33.242	1.720	23.457	1.221	16.657
20 2006	0.0	10.520	10.520	143.460	2.257	30.779	1.564	21.325	1.091	14.872
21 2007	0.0	10.520	10.520	143.460	2.090	28.500	1.422	19.366	0.974	13.279
22 2008	0.0	10.520	10.520	143.460	1.935	26.388	1.292	17.624	0.869	11.856
23 2009	0.0	10.520	10.520	143.460	1.792	24.434	1.175	16.022	0.776	10.586
24 2010	0.0	10.520	10.520	143.460	1.659	22.624	1.068	14.565	0.693	9.452
25 2011	0.0	10.520	10.520	143.460	1.536	20.948	0.911	13.241	0.619	8.439
26 2012	0.0	13.020	13.020	143.460	1.460	19.396	1.092	12.037	0.684	7.533
27 2013	0.0	10.520	10.520	143.460	1.317	17.960	0.802	10.943	0.493	6.727
28 2014	0.0	10.520	10.520	143.460	1.219	16.629	0.730	9.948	0.440	6.007
29 2015	0.0	10.520	10.520	143.460	1.129	15.397	0.663	9.044	0.393	5.363
30 2016	0.0	18.650	18.650	143.460	1.853	14.257	1.069	8.222	0.623	4.788
31 2017	0.0	18.950	18.950	143.460	1.744	13.201	0.987	7.474	0.565	4.275
32 2018	0.0	10.520	10.520	143.460	0.996	12.223	0.498	6.795	0.280	3.817
33 2019	0.0	24.040	24.040	143.460	1.897	11.318	1.035	6.177	0.390	3.408
34 2020	0.0	18.380	18.380	143.460	1.343	10.479	0.719	5.616	0.390	3.043
35 2021	0.0	10.520	10.520	143.460	0.712	9.703	0.574	5.105	0.199	2.717
36 2022	0.0	13.020	13.020	143.460	0.815	8.984	0.441	4.641	0.220	2.426
37 2023	0.0	10.520	10.520	143.460	0.610	8.319	0.309	4.219	0.159	2.166
38 2024	0.0	10.520	10.520	143.460	0.565	7.703	0.281	3.836	0.142	1.934
39 2025	0.0	10.520	10.520	143.460	0.523	7.132	0.256	3.487	0.127	1.727
40 2026	0.0	10.520	10.520	143.460	0.484	6.604	0.232	3.170	0.113	1.542
41 2027	0.0	10.520	10.520	143.460	0.448	6.115	0.211	2.892	0.101	1.377
42 2028	0.0	10.520	10.520	143.460	0.415	5.662	0.192	2.620	0.090	1.229
43 2029	0.0	10.520	10.520	143.460	0.384	5.242	0.173	2.362	0.080	1.097
44 2030	0.0	10.520	10.520	143.460	0.356	4.854	0.159	2.165	0.072	0.980
45 2031	0.0	10.520	10.520	143.460	0.330	4.494	0.144	1.968	0.064	0.875
46 2032	0.0	13.020	13.020	143.460	0.378	4.162	0.162	1.789	0.071	0.781
47 2033	0.0	10.520	10.520	143.460	0.283	3.853	0.119	1.627	0.051	0.697
48 2034	0.0	10.520	10.520	143.460	0.262	3.568	0.108	1.479	0.046	0.623
49 2035	0.0	10.520	10.520	143.460	0.242	3.304	0.099	1.344	0.041	0.556
50 2036	0.0	10.520	10.520	143.460	0.224	3.059	0.090	1.222	0.036	0.496
TOTAL	1029.577	494.500	1524.077	5999.990	4475.913	780.912	931.632	660.778	634.215	484.330

BENEFIT COST RATIO BY DISCOUNT RATE (B/C) = 1.19 (8%), 0.94 (10%), 0.76 (12%)
INTERNAL RATE OF RETURN (IRR) = 9.5 %

Table XI-1-21 PROJECT COST AND BENEFITS, SENSITIVITY ANALYSIS, CASE 2

(UNIT : MILLION BAHT

YEAR	PROJECT COST		TOTAL	BENEFITS	RETURN	8 %		10 %		12 %	
	CAPITAL	O & M				(COST)	(BENEFITS)	(COST)	(BENEFITS)	(COST)	(BENEFITS)
1 1987	4.680	0.0	4.680	0.0	-4.680	4.680	0.0	4.680	0.0	4.680	0.0
2 1988	34.630	0.0	34.630	0.0	-34.630	29.690	0.0	28.620	0.0	27.607	0.0
3 1989	253.330	0.0	253.330	0.0	-253.330	201.102	0.0	190.331	0.0	180.315	0.0
4 1990	198.400	0.0	198.400	0.0	-198.400	145.830	0.0	135.510	0.0	126.087	0.0
5 1991	89.650	2.330	92.180	4.680	-87.500	62.736	3.165	57.237	2.906	52.305	2.856
6 1992	69.260	3.110	72.370	17.290	-55.080	45.606	10.896	40.851	9.760	36.665	8.760
7 1993	86.110	3.980	90.090	34.710	-55.380	52.567	20.253	46.231	17.812	40.752	15.791
8 1994	122.620	5.470	128.090	49.010	-79.080	69.203	26.479	59.755	22.864	51.734	19.794
9 1995	58.030	6.630	64.660	65.320	-0.660	32.346	32.676	27.422	27.702	25.317	23.555
10 1996	11.230	6.870	18.100	87.100	69.000	8.384	40.344	6.978	33.581	5.828	28.044
11 1997	5.620	8.850	14.470	105.070	90.600	6.206	45.063	5.072	36.827	4.160	30.205
12 1998	0.900	9.850	10.750	115.540	104.269	4.269	45.883	3.425	36.815	2.759	29.656
13 1999	0.620	10.330	10.950	119.920	108.970	4.026	44.095	3.172	34.737	2.509	27.483
14 2000	0.350	10.450	10.800	122.170	111.370	3.677	41.594	2.844	32.172	2.210	24.999
15 2001	0.210	10.490	10.700	123.120	112.420	3.373	38.613	2.562	29.474	1.955	22.494
16 2002	0.140	13.020	13.160	123.390	110.230	3.841	36.017	2.864	26.854	2.147	20.128
17 2003	0.0	10.520	10.520	123.390	112.870	2.843	33.349	2.081	24.412	1.532	17.971
18 2004	0.0	10.520	10.520	123.390	112.870	2.633	30.879	1.892	22.193	1.368	16.046
19 2005	0.0	10.520	10.520	123.390	112.870	2.438	28.591	1.720	20.176	1.221	14.327
20 2006	0.0	10.520	10.520	123.390	112.870	2.257	26.473	1.564	18.341	1.091	12.792
21 2007	0.0	10.520	10.520	123.390	112.870	2.090	24.512	1.422	16.674	0.974	11.421
22 2008	0.0	10.520	10.520	123.390	112.870	1.935	22.622	1.292	15.158	0.869	10.197
23 2009	0.0	10.520	10.520	123.390	112.870	1.792	21.015	1.175	13.780	0.776	9.105
24 2010	0.0	10.520	10.520	123.390	112.870	1.659	19.459	1.068	12.528	0.693	8.129
25 2011	0.0	10.520	10.520	123.390	112.870	1.536	18.017	0.971	11.389	0.619	7.258
26 2012	0.0	13.020	13.020	123.390	110.370	1.760	16.683	1.092	10.353	0.684	6.481
27 2013	0.0	10.520	10.520	123.390	112.870	1.317	15.447	0.802	9.412	0.493	5.786
28 2014	0.0	10.520	10.520	123.390	112.870	1.219	14.303	0.730	8.556	0.440	5.166
29 2015	0.0	10.520	10.520	123.390	112.870	1.129	13.243	0.663	7.779	0.393	4.615
30 2016	0.0	18.650	18.650	123.390	104.740	1.853	12.262	1.069	7.071	0.623	4.119
31 2017	0.0	18.950	18.950	123.390	104.440	1.744	11.354	0.987	6.429	0.565	3.677
32 2018	0.0	10.520	10.520	123.390	112.870	0.896	10.213	0.498	5.844	0.280	3.283
33 2019	0.0	24.040	24.040	123.390	99.350	1.897	9.734	1.035	5.313	0.571	2.922
34 2020	0.0	18.380	18.380	123.390	105.010	1.343	9.013	0.719	4.830	0.390	2.617
35 2021	0.0	10.520	10.520	123.390	112.870	0.712	8.346	0.374	4.391	0.199	2.337
36 2022	0.0	13.020	13.020	123.390	110.370	0.815	7.727	0.421	3.992	0.220	2.087
37 2023	0.0	10.520	10.520	123.390	112.870	0.610	7.155	0.309	3.629	0.159	1.863
38 2024	0.0	10.520	10.520	123.390	112.870	0.565	6.625	0.281	3.299	0.142	1.663
39 2025	0.0	10.520	10.520	123.390	112.870	0.523	6.134	0.256	2.999	0.127	1.485
40 2026	0.0	10.520	10.520	123.390	112.870	0.484	5.680	0.232	2.726	0.113	1.326
41 2027	0.0	10.520	10.520	123.390	112.870	0.448	5.239	0.211	2.479	0.101	1.184
42 2028	0.0	10.520	10.520	123.390	112.870	0.415	4.870	0.192	2.253	0.090	1.057
43 2029	0.0	10.520	10.520	123.390	112.870	0.384	4.509	0.175	2.048	0.080	0.944
44 2030	0.0	10.520	10.520	123.390	112.870	0.356	4.175	0.159	1.862	0.072	0.843
45 2031	0.0	10.520	10.520	123.390	112.870	0.330	3.866	0.144	1.693	0.064	0.752
46 2032	0.0	13.020	13.020	123.390	110.370	0.378	3.579	0.162	1.539	0.071	0.672
47 2033	0.0	10.520	10.520	123.390	112.870	0.283	3.314	0.119	1.399	0.051	0.600
48 2034	0.0	10.520	10.520	123.390	112.870	0.262	3.069	0.108	1.272	0.046	0.536
49 2035	0.0	10.520	10.520	123.390	112.870	0.242	2.841	0.099	1.156	0.041	0.478
50 2036	0.0	10.520	10.520	123.390	112.870	0.224	2.631	0.090	1.051	0.036	0.427
TOTAL	935.980	494.500	1430.480	5162.580	3732.100	716.908	602.624	641.670	569.530	580.225	417.648

BENEFIT COST RATIO BY DISCOUNT RATE (B/C) = 1.12 (8%), 0.89 (10%), 0.72 (12%)
 INTERNAL RATE OF RETURN (IRR) = 5.0%

Table XI-1-22 PROJECT COST AND BENEFITS, SENSITIVITY ANALYSIS, CASE 3

(UNIT : MILLION BAHT

YEAR	PROJECT COST		TOTAL	BENEFITS	RETURN	8 %		10 %		12 %	
	CAPITAL	O & M				(COST)	(BENEFITS)	(COST)	(BENEFITS)	(COST)	(BENEFITS)
1 1987	4.680	0.0	4.680	0.0	-4.680	4.680	0.0	4.680	0.0	4.680	0.0
2 1988	34.630	0.0	34.630	0.0	-34.630	29.690	0.0	28.620	0.0	27.607	0.0
3 1989	253.330	0.0	253.330	0.0	-253.330	201.102	0.0	190.331	0.0	180.315	0.0
4 1990	198.400	0.0	198.400	0.0	-198.400	145.830	0.0	135.510	0.0	126.087	0.0
5 1991	89.850	3.330	92.180	4.200	-87.980	62.736	2.858	57.237	2.608	52.305	2.383
6 1992	68.260	3.110	72.370	14.170	-58.200	45.606	8.930	40.851	7.999	36.665	7.179
7 1993	86.110	3.980	90.090	27.130	-62.960	52.567	15.830	46.231	13.922	40.752	12.272
8 1994	122.620	5.470	128.090	37.820	-90.270	69.203	20.433	59.755	17.643	51.734	15.275
9 1995	58.030	6.630	64.660	54.130	-10.530	32.346	27.079	27.422	22.957	23.317	19.520
10 1996	11.230	6.870	18.100	77.600	59.500	8.384	35.944	6.978	29.918	5.828	24.985
11 1997	5.620	8.850	14.470	96.900	82.430	6.206	41.599	5.072	33.963	4.160	27.857
12 1998	0.900	9.650	10.550	111.430	100.680	4.269	44.251	3.425	35.505	2.759	28.601
13 1999	0.620	10.330	10.950	122.460	111.510	4.026	45.029	3.172	35.473	2.509	28.065
14 2000	0.350	10.450	10.800	130.390	119.590	3.677	44.393	2.844	34.336	2.210	26.681
15 2001	0.210	10.490	10.700	136.160	125.460	3.373	42.924	2.562	32.596	1.955	24.876
16 2002	0.140	13.080	13.160	140.710	127.550	3.841	41.072	2.864	30.623	2.147	22.953
17 2003	0.0	10.520	10.520	142.970	132.450	2.843	38.641	2.081	28.286	1.532	20.823
18 2004	0.0	10.520	10.520	143.460	132.940	2.633	35.901	1.892	25.803	1.368	18.656
19 2005	0.0	10.520	10.520	143.460	132.940	2.438	33.242	1.720	23.457	1.221	16.657
20 2006	0.0	10.520	10.520	143.460	132.940	2.237	30.779	1.564	21.325	1.091	14.872
21 2007	0.0	10.520	10.520	143.460	132.940	2.090	28.500	1.422	19.386	0.974	13.279
22 2008	0.0	10.520	10.520	143.460	132.940	1.935	26.388	1.292	17.624	0.869	11.856
23 2009	0.0	10.520	10.520	143.460	132.940	1.792	24.434	1.175	16.022	0.776	10.586
24 2010	0.0	10.520	10.520	143.460	132.940	1.659	22.624	1.068	14.565	0.693	9.452
25 2011	0.0	10.520	10.520	143.460	132.940	1.536	20.968	0.971	13.241	0.619	8.439
26 2012	0.0	13.080	13.020	143.460	130.440	1.420	19.346	0.902	12.037	0.684	7.535
27 2013	0.0	10.520	10.520	143.460	132.940	1.317	17.800	0.802	10.943	0.493	6.727
28 2014	0.0	10.520	10.520	143.460	132.940	1.219	16.629	0.730	9.948	0.440	6.007
29 2015	0.0	10.520	10.520	143.460	132.940	1.129	15.397	0.663	9.044	0.393	5.363
30 2016	0.0	18.650	18.650	143.460	124.810	1.053	14.257	0.609	8.222	0.623	4.788
31 2017	0.0	18.950	18.950	143.460	124.510	1.044	13.201	0.987	7.474	0.565	4.275
32 2018	0.0	10.520	10.520	143.460	132.940	0.896	12.233	0.498	6.795	0.280	3.817
33 2019	0.0	24.000	24.040	143.460	119.420	1.897	11.318	1.035	6.177	0.571	3.408
34 2020	0.0	18.380	18.380	143.460	125.080	1.343	10.479	0.719	5.616	0.390	3.043
35 2021	0.0	10.520	10.520	143.460	132.940	0.712	9.703	0.374	5.103	0.199	2.717
36 2022	0.0	13.020	13.020	143.460	130.440	0.815	8.984	0.421	4.641	0.220	2.426
37 2023	0.0	10.520	10.520	143.460	132.940	0.610	8.319	0.309	4.219	0.159	2.166
38 2024	0.0	10.520	10.520	143.460	132.940	0.565	7.703	0.281	3.936	0.142	1.934
39 2025	0.0	10.520	10.520	143.460	132.940	0.523	7.132	0.256	3.487	0.127	1.727
40 2026	0.0	10.520	10.520	143.460	132.940	0.484	6.604	0.232	3.170	0.113	1.542
41 2027	0.0	10.520	10.520	143.460	132.940	0.448	6.115	0.211	2.882	0.101	1.377
42 2028	0.0	10.520	10.520	143.460	132.940	0.415	5.662	0.192	2.620	0.090	1.229
43 2029	0.0	10.520	10.520	143.460	132.940	0.384	5.242	0.175	2.382	0.080	1.097
44 2030	0.0	10.520	10.520	143.460	132.940	0.356	4.854	0.159	2.165	0.072	0.960
45 2031	0.0	10.520	10.520	143.460	132.940	0.330	4.494	0.144	1.968	0.064	0.875
46 2032	0.0	13.020	13.020	143.460	130.440	0.378	4.162	0.162	1.789	0.071	0.781
47 2033	0.0	10.520	10.520	143.460	132.940	0.283	3.853	0.119	1.627	0.051	0.697
48 2034	0.0	10.520	10.520	143.460	132.940	0.262	3.568	0.108	1.479	0.046	0.623
49 2035	0.0	10.520	10.520	143.460	132.940	0.242	3.304	0.099	1.344	0.041	0.556
50 2036	0.0	10.520	10.520	143.460	132.940	0.224	3.059	0.090	1.222	0.036	0.496
TOTAL	935.980	494.500	1430.480	5830.250	4399.770	716.908	855.375	641.670	597.443	580.225	431.453

BENEFIT COST RATIO BY DISCOUNT RATE (B/C) = 1.19 (8%), 0.93 (10%), 0.74 (12%)
INTERNAL RATE OF RETURN (IRR) = 9.4 %

Table XI-1-23

PROJECT COST AND BENEFITS, SENSITIVITY ANALYSIS, CASE 4

(UNIT: MILLION BART)

YEAR	PROJECT COST		TOTAL	BENEFITS	RETURN	8%		10%		12%	
	CAPITAL	O & M				(COST)	(BENEFITS)	(COST)	(BENEFITS)	(COST)	(BENEFITS)
1 1987	2,720	0.0	2,720	0.0	-2,720	2,720	0.0	2,720	0.0	2,720	0.0
2 1988	22,300	0.0	22,300	0.0	-22,300	19,119	0.0	18,430	0.0	17,777	0.0
3 1989	234,780	0.0	234,780	0.0	-234,780	186,394	0.0	176,394	0.0	167,112	0.0
4 1990	192,380	0.0	192,380	0.0	-192,380	141,405	0.0	131,399	0.0	122,261	0.0
5 1991	73,820	2,330	76,150	5,260	-70,890	51,827	3,580	47,283	3,266	43,210	2,965
6 1992	38,480	3,110	41,590	19,500	-22,090	26,209	12,288	23,477	11,007	21,071	9,879
7 1993	51,230	3,980	55,210	35,920	-19,290	32,215	20,959	28,332	18,433	24,974	16,243
8 1994	57,290	5,470	62,760	47,440	-15,320	39,907	25,630	29,278	22,131	25,348	19,160
9 1995	75,770	6,830	82,600	56,240	-26,360	41,221	28,134	34,946	23,851	29,714	20,281
10 1996	117,180	8,870	124,050	65,880	-58,170	57,459	30,551	47,827	25,400	39,941	21,212
11 1997	55,860	8,850	64,710	83,130	-18,420	27,753	35,653	22,681	29,137	18,603	23,898
12 1998	9,050	9,850	18,900	105,520	86,620	7,506	41,904	6,022	33,622	4,851	27,084
13 1999	3,440	10,530	13,970	123,700	109,930	5,063	45,485	3,989	35,832	3,156	28,349
14 2000	0.360	10,450	10,810	135,120	124,310	3,680	46,003	2,847	35,582	2,212	27,648
15 2001	0.620	10,490	11,110	139,800	128,690	3,502	44,071	2,660	33,467	2,030	25,541
16 2002	0.350	13,020	13,370	142,090	128,720	3,903	41,475	2,910	30,923	2,181	23,178
17 2003	0.210	10,520	10,730	143,160	132,430	2,900	38,692	2,123	28,324	1,563	20,851
18 2004	0.140	10,520	10,660	143,460	132,800	2,668	35,901	1,917	25,803	1,386	18,656
19 2005	0.0	10,520	10,520	143,460	132,940	2,438	33,242	1,720	23,457	1,221	16,657
20 2006	0.0	10,520	10,520	143,460	132,940	2,237	30,779	1,564	21,325	1,091	14,872
21 2007	0.0	10,520	10,520	143,460	132,940	2,090	28,500	1,422	19,386	0,974	13,279
22 2008	0.0	10,520	10,520	143,460	132,940	1,935	26,388	1,292	17,624	0,869	11,856
23 2009	0.0	10,520	10,520	143,460	132,940	1,792	24,434	1,175	16,022	0,776	10,586
24 2010	0.0	10,520	10,520	143,460	132,940	1,659	22,624	1,068	14,565	0,693	9,452
25 2011	0.0	10,520	10,520	143,460	132,940	1,536	20,948	0,971	13,241	0,619	8,439
26 2012	0.0	13,020	13,020	143,460	130,440	1,760	19,396	1,092	12,037	0,684	7,535
27 2013	0.0	10,520	10,520	143,460	132,940	1,717	17,960	0,802	10,943	0,493	6,727
28 2014	0.0	10,520	10,520	143,460	132,940	1,219	16,629	0,730	9,948	0,440	6,007
29 2015	0.0	10,520	10,520	143,460	132,940	1,129	15,397	0,663	9,044	0,393	5,363
30 2016	0.0	18,650	18,650	143,460	124,810	1,853	14,257	1,069	8,222	0,623	4,788
31 2017	0.0	18,950	18,950	143,460	124,510	1,744	13,201	0,987	7,474	0,565	4,275
32 2018	0.0	10,520	10,520	143,460	132,940	0,896	12,223	0,498	6,795	0,280	3,817
33 2019	0.0	24,040	24,040	143,460	119,420	1,897	11,318	1,035	6,177	0,571	3,408
34 2020	0.0	18,380	18,380	143,460	125,080	1,343	10,475	0,719	5,616	0,390	3,043
35 2021	0.0	10,520	10,520	143,460	132,940	0,712	9,703	0,374	5,105	0,199	2,717
36 2022	0.0	13,020	13,020	143,460	130,440	0,815	8,984	0,421	4,641	0,220	2,426
37 2023	0.0	10,520	10,520	143,460	132,940	0,610	8,319	0,309	4,219	0,159	2,166
38 2024	0.0	10,520	10,520	143,460	132,940	0,565	7,703	0,281	3,836	0,142	1,934
39 2025	0.0	10,520	10,520	143,460	132,940	0,523	7,132	0,256	3,487	0,127	1,727
40 2026	0.0	10,520	10,520	143,460	132,940	0,484	6,604	0,232	3,170	0,113	1,542
41 2027	0.0	10,520	10,520	143,460	132,940	0,448	6,115	0,211	2,882	0,101	1,377
42 2028	0.0	10,520	10,520	143,460	132,940	0,415	5,662	0,192	2,620	0,090	1,229
43 2029	0.0	10,520	10,520	143,460	132,940	0,384	5,242	0,175	2,382	0,080	1,097
44 2030	0.0	10,520	10,520	143,460	132,940	0,356	4,854	0,159	2,165	0,072	0,980
45 2031	0.0	10,520	10,520	143,460	132,940	0,330	4,494	0,144	1,968	0,064	0,875
46 2032	0.0	13,020	13,020	143,460	130,440	0,318	4,162	0,162	1,789	0,071	0,781
47 2033	0.0	10,520	10,520	143,460	132,940	0,283	3,853	0,119	1,627	0,051	0,697
48 2034	0.0	10,520	10,520	143,460	132,940	0,262	3,568	0,108	1,479	0,046	0,623
49 2035	0.0	10,520	10,520	143,460	132,940	0,242	3,304	0,099	1,344	0,041	0,556
50 2036	0.0	10,520	10,520	143,460	132,940	0,224	3,059	0,090	1,222	0,036	0,495
TOTAL	935,980	494,500	1,430,480	5896,940	4,406,460	683,939	460,623	603,375	462,590	542,404	436,298

BENEFIT COST RATIO BY DISCOUNT RATE (B/C) = 1.26 (8%), 1.00 (10%), 0.80 (12%)

Table XI-I-24 PROJECT COST AND BENEFITS - SENSITIVITY ANALYSIS, CASE 5
13% INCREASE OF CONSTRUCTION COST

(UNIT : MILLION BAHT

YEAR	PROJECT COST		RETURN	8 %		10 %		12 %	
	CAPITAL	O & M		(COST)	(BENEFITS)	(COST)	(BENEFITS)	(COST)	(BENEFITS)
1 1987	5.148	0.0	-5.148	5.148	0.0	5.148	0.0	5.148	0.0
2 1988	38.093	0.0	-38.093	31.482	0.0	31.482	0.0	30.368	0.0
3 1989	278.663	0.0	-278.663	221.212	0.0	209.564	0.0	198.347	0.0
4 1990	218.240	0.0	-218.240	160.413	0.0	149.061	0.0	138.696	0.0
5 1991	98.835	2.330	-96.485	68.851	3.185	62.816	2.906	57.404	2.656
6 1992	76.186	3.110	-79.296	49.970	10.896	44.781	9.760	40.174	8.760
7 1993	94.721	3.980	-63.991	57.591	20.253	50.649	17.812	44.647	15.701
8 1994	134.882	5.470	-91.342	75.828	26.479	65.476	22.864	56.686	19.794
9 1995	63.633	6.630	-65.320	35.249	32.676	29.883	27.702	23.410	23.555
10 1996	12.353	6.670	-5.143	8.904	40.344	7.411	33.581	6.189	28.044
11 1997	6.182	8.850	97.038	6.447	45.063	5.269	36.827	4.321	30.205
12 1998	0.990	9.850	104.700	4.305	45.883	3.454	36.815	2.782	29.656
13 1999	0.682	10.350	108.908	4.049	44.095	3.190	34.737	2.524	27.483
14 2000	0.385	10.450	111.335	3.689	41.594	2.853	32.172	2.217	24.999
15 2001	0.231	10.490	112.399	3.380	38.813	2.567	29.474	1.959	22.494
16 2002	0.154	10.520	110.216	2.845	36.017	2.081	26.854	2.149	20.128
17 2003	0.0	10.520	112.870	2.633	30.879	1.892	22.193	1.368	16.046
18 2004	0.0	10.520	112.870	2.438	28.591	1.720	20.176	1.221	14.327
19 2005	0.0	10.520	112.870	2.257	26.473	1.564	18.341	1.091	12.792
20 2006	0.0	10.520	112.870	2.090	24.512	1.422	16.674	0.974	11.421
21 2007	0.0	10.520	112.870	1.935	22.697	1.292	15.158	0.869	10.197
22 2008	0.0	10.520	112.870	1.792	21.015	1.175	13.780	0.776	9.105
23 2009	0.0	10.520	112.870	1.659	19.459	1.068	12.528	0.693	8.129
24 2010	0.0	10.520	112.870	1.536	18.017	0.971	11.389	0.619	7.258
25 2011	0.0	10.520	112.870	1.421	16.683	0.892	10.353	0.684	6.481
26 2012	0.0	13.020	110.370	1.760	15.447	1.082	9.412	0.442	5.786
27 2013	0.0	10.520	112.870	1.317	15.447	0.802	8.526	0.440	5.166
28 2014	0.0	10.520	112.870	1.219	14.503	0.730	7.779	0.393	4.619
29 2015	0.0	10.520	112.870	1.129	13.243	0.663	7.071	0.323	4.119
30 2016	0.0	18.650	104.740	1.853	12.262	1.069	6.429	0.260	3.677
31 2017	0.0	18.950	104.440	1.744	11.354	0.987	5.844	0.260	3.283
32 2018	0.0	10.520	112.870	0.896	10.513	0.498	5.313	0.260	2.932
33 2019	0.0	24.040	99.350	1.897	9.734	1.033	4.830	0.260	2.617
34 2020	0.0	18.380	105.010	1.343	9.013	0.419	4.391	0.199	2.337
35 2021	0.0	10.520	112.870	0.712	8.346	0.374	4.031	0.199	2.087
36 2022	0.0	13.020	110.370	0.815	7.727	0.421	3.992	0.220	1.863
37 2023	0.0	10.520	112.870	0.610	7.155	0.309	3.659	0.159	1.663
38 2024	0.0	10.520	112.870	0.565	6.625	0.281	3.299	0.142	1.485
39 2025	0.0	10.520	112.870	0.523	6.134	0.256	2.958	0.127	1.326
40 2026	0.0	10.520	112.870	0.484	5.680	0.232	2.726	0.113	1.184
41 2027	0.0	10.520	112.870	0.448	5.259	0.211	2.479	0.101	1.057
42 2028	0.0	10.520	112.870	0.415	4.870	0.192	2.253	0.090	0.944
43 2029	0.0	10.520	112.870	0.384	4.509	0.175	2.048	0.080	0.843
44 2030	0.0	10.520	112.870	0.356	4.175	0.159	1.862	0.072	0.752
45 2031	0.0	10.520	112.870	0.330	3.866	0.144	1.693	0.064	0.672
46 2032	0.0	13.020	110.370	0.378	3.579	0.162	1.539	0.071	0.600
47 2033	0.0	10.520	112.870	0.283	3.314	0.119	1.399	0.031	0.536
48 2034	0.0	10.520	112.870	0.262	3.069	0.108	1.272	0.045	0.478
49 2035	0.0	10.520	112.870	0.242	2.841	0.099	1.156	0.041	0.427
50 2036	0.0	10.520	112.870	0.224	2.631	0.090	1.051	0.036	0.380
TOTAL	2029.577	494.500	3638.503	780.912	802.624	700.366	569.630	634.215	417.648

BENEFIT COST RATIO BY DISCOUNT RATE (B/C) = 1.03 (6%), 0.81 (10%), 0.66 (12%)
INTERNAL RATE OF RETURN (IRR) = 8.2 %

Table XI-1-25 PROJECT COST AND BENEFITS, SENSITIVITY ANALYSIS, CASE 6
10% INCREASE OF CONSTRUCTION COST

(UNIT : MILLION BAHT)

YEAR	PROJECT COST		RETURN	PRESENT WORTH VALUE BY DISCOUNT RATE		12% (BENEFITS)	
	CAPITAL	O & M		(COST)	(BENEFITS)	(COST)	(BENEFITS)
1 1987	5.148	0.0	-5.148	5.148	0.0	5.148	0.0
2 1988	38.093	0.0	-38.093	32.659	0.0	31.482	0.0
3 1989	278.663	0.0	-278.663	221.212	0.0	209.364	0.0
4 1990	218.240	0.0	-218.240	160.413	0.0	149.696	0.0
5 1991	98.835	2.330	-97.505	68.851	2.437	62.816	2.442
6 1992	76.186	3.110	-75.076	49.970	7.682	44.761	6.881
7 1993	94.721	3.980	-90.741	57.591	13.613	50.649	11.972
8 1994	134.882	5.470	-129.412	75.828	65.476	56.686	13.138
9 1995	63.833	6.630	-57.203	35.249	23.297	19.750	16.794
10 1996	12.353	6.870	-6.517	7.411	30.918	6.189	21.492
11 1997	6.182	8.850	-2.668	6.447	5.269	4.321	23.958
12 1998	0.990	9.850	-8.860	4.305	38.060	2.782	24.600
13 1999	0.682	10.330	-9.648	4.049	38.730	2.524	24.139
14 2000	0.385	10.835	-10.450	3.689	38.183	2.217	22.948
15 2001	0.231	10.490	-10.259	3.380	29.533	1.959	21.396
16 2002	0.154	13.020	-12.866	3.845	35.328	2.149	19.743
17 2003	0.0	10.520	-10.520	2.843	33.235	1.532	17.910
18 2004	0.0	10.520	-10.520	2.633	30.879	1.368	16.046
19 2005	0.0	10.520	-10.520	2.438	28.591	1.221	14.327
20 2006	0.0	10.520	-10.520	2.257	26.473	1.091	12.792
21 2007	0.0	10.520	-10.520	2.090	24.512	0.974	11.421
22 2008	0.0	10.520	-10.520	1.935	22.697	0.869	10.197
23 2009	0.0	10.520	-10.520	1.792	21.015	0.776	9.105
24 2010	0.0	10.520	-10.520	1.659	19.459	0.693	8.129
25 2011	0.0	10.520	-10.520	1.536	18.017	0.619	7.258
26 2012	0.0	13.020	-13.020	1.420	16.683	0.556	6.481
27 2013	0.0	10.520	-10.520	1.317	15.442	0.493	5.786
28 2014	0.0	10.520	-10.520	1.219	14.303	0.440	5.166
29 2015	0.0	10.520	-10.520	1.129	13.243	0.393	4.613
30 2016	0.0	18.950	-18.950	1.047	12.262	0.351	4.119
31 2017	0.0	18.950	-18.950	1.744	11.354	0.313	3.677
32 2018	0.0	10.520	-10.520	0.896	10.513	0.280	3.283
33 2019	0.0	24.040	-24.040	1.897	9.734	0.251	2.932
34 2020	0.0	18.380	-18.380	1.343	9.013	0.220	2.617
35 2021	0.0	10.520	-10.520	0.712	8.346	0.199	2.337
36 2022	0.0	13.020	-13.020	0.815	7.727	0.177	2.087
37 2023	0.0	10.520	-10.520	0.610	7.155	0.159	1.863
38 2024	0.0	10.520	-10.520	0.565	6.625	0.142	1.663
39 2025	0.0	10.520	-10.520	0.523	6.134	0.127	1.485
40 2026	0.0	10.520	-10.520	0.484	5.680	0.113	1.326
41 2027	0.0	10.520	-10.520	0.448	5.259	0.101	1.184
42 2028	0.0	10.520	-10.520	0.415	4.870	0.090	1.057
43 2029	0.0	10.520	-10.520	0.384	4.509	0.080	0.944
44 2030	0.0	10.520	-10.520	0.356	4.175	0.072	0.843
45 2031	0.0	10.520	-10.520	0.330	3.866	0.064	0.752
46 2032	0.0	13.020	-13.020	0.378	3.579	0.051	0.670
47 2033	0.0	10.520	-10.520	0.283	3.314	0.046	0.596
48 2034	0.0	10.520	-10.520	0.262	3.069	0.041	0.536
49 2035	0.0	10.520	-10.520	0.242	2.841	0.036	0.478
50 2036	0.0	10.520	-10.520	0.224	2.631	0.032	0.427
TOTAL	1029.577	494.500	1524.077	780.912	735.716	634.215	371.098

BENEFIT COST RATIO BY DISCOUNT RATE (B/C) = 0.94 (8%), 0.73 (10%), 0.59 (12%)

Table XI-1-26 PROJECT COST AND BENEFITS, SENSITIVITY ANALYSIS, CASE 7
10% INCREASE OF CONSTRUCTION COST

(UNIT : MILLION BAHT)

YEAR	PROJECT COST		RETURN	PRESENT WORTH		VALUE BY DISCOUNT RATE		12 % (BENEFITS)
	CAPITAL	O & M		(BENEFITS)	(COST)	(BENEFITS)	(COST)	
1 1987	2,992	0.0	-2,992	0.0	2,992	0.0	2,992	0.0
2 1988	24,530	0.0	-24,530	0.0	20,273	0.0	19,555	0.0
3 1989	258,258	0.0	-258,258	0.0	194,033	0.0	183,823	0.0
4 1990	211,618	0.0	-211,618	0.0	144,538	0.0	134,437	0.0
5 1991	81,202	2,330	-79,872	2,457	51,851	2,242	47,398	2,048
6 1992	42,328	3,110	-39,218	7,682	25,649	6,881	23,020	6,176
7 1993	56,353	3,980	-52,373	12,190	30,961	10,797	27,292	9,517
8 1994	63,019	5,470	-57,549	14,982	31,951	12,936	27,662	11,200
9 1995	93,347	6,030	-87,317	17,664	38,159	14,805	32,447	12,589
10 1996	128,898	6,870	-122,028	20,390	52,345	16,972	43,714	14,173
11 1997	61,446	8,850	-70,296	25,077	24,639	20,494	20,208	16,809
12 1998	9,955	9,850	56,625	30,352	6,311	24,353	5,083	19,618
13 1999	3,784	10,330	76,136	33,185	4,088	26,143	3,235	20,683
14 2000	0.0	10,450	88,534	33,835	2,836	26,170	2,019	20,335
15 2001	0.682	10,490	99,598	33,659	2,675	25,560	2,041	19,507
16 2002	0.385	13,030	99,565	32,975	2,917	24,586	2,187	18,428
17 2003	0.231	10,520	106,769	31,762	2,127	23,251	1,566	17,116
18 2004	0.134	10,520	110,356	30,288	1,920	21,769	1,388	15,739
19 2005	0.0	10,520	112,450	28,494	1,720	20,107	1,221	14,278
20 2006	0.0	10,520	112,870	26,473	1,564	18,341	1,091	12,792
21 2007	0.0	10,520	112,870	24,512	1,422	16,674	0,974	11,421
22 2008	0.0	10,520	112,870	22,697	1,292	15,158	0,869	10,197
23 2009	0.0	10,520	112,870	21,015	1,175	13,780	0,776	9,105
24 2010	0.0	10,520	112,870	19,459	1,068	12,528	0,693	8,129
25 2011	0.0	10,520	112,870	18,017	0,971	11,389	0,619	7,258
26 2012	0.0	13,020	110,370	16,683	0,884	10,359	0,556	6,481
27 2013	0.0	10,520	112,870	15,447	0,802	9,442	0,493	5,786
28 2014	0.0	10,520	112,870	14,303	0,730	8,528	0,440	5,166
29 2015	0.0	10,520	112,870	13,243	0,663	7,779	0,393	4,613
30 2016	0.0	18,650	104,740	12,262	0,609	7,071	0,353	4,119
31 2017	0.0	18,950	104,440	11,354	0,567	6,429	0,323	3,677
32 2018	0.0	10,520	112,870	10,513	0,498	5,844	0,280	3,283
33 2019	0.0	24,040	99,350	9,734	0,435	5,313	0,251	2,932
34 2020	0.0	18,380	105,010	9,013	0,374	4,830	0,220	2,617
35 2021	0.0	10,520	112,870	8,346	0,320	4,391	0,199	2,337
36 2022	0.0	13,020	110,370	7,727	0,271	4,021	0,175	2,087
37 2023	0.0	10,520	112,870	7,155	0,228	3,629	0,159	1,863
38 2024	0.0	10,520	112,870	6,625	0,189	3,299	0,142	1,663
39 2025	0.0	10,520	112,870	6,134	0,156	2,999	0,127	1,485
40 2026	0.0	10,520	112,870	5,680	0,123	2,726	0,113	1,326
41 2027	0.0	10,520	112,870	5,259	0,092	2,479	0,101	1,184
42 2028	0.0	10,520	112,870	4,870	0,072	2,253	0,090	1,057
43 2029	0.0	10,520	112,870	4,509	0,059	2,048	0,080	0,944
44 2030	0.0	10,520	112,870	4,175	0,048	1,862	0,072	0,843
45 2031	0.0	10,520	112,870	3,866	0,044	1,693	0,064	0,752
46 2032	0.0	13,020	110,370	3,578	0,037	1,539	0,051	0,672
47 2033	0.0	10,520	112,870	3,314	0,031	1,399	0,046	0,600
48 2034	0.0	10,520	112,870	3,069	0,026	1,272	0,041	0,536
49 2035	0.0	10,520	112,870	2,841	0,022	1,156	0,041	0,478
50 2036	0.0	10,520	112,870	2,631	0,024	1,051	0,036	0,427
TOTAL	1029,577	494,500	4874,321	743,975	660,442	468,311	592,612	334,046

BENEFIT COST RATIO BY DISCOUNT RATE (B/C) = 0.91 (8%), 0.71 (10%), 0.56 (12%)
INTERNAL RATE OF RETURN (IRR) = 7.4 %

Table XI-1-27 PROJECT COST AND BENEFITS, SENSITIVITY ANALYSIS, CASE 8

(UNIT : MILLION BAHT)

YEAR	PROJECT COST		RETURN	PRESENT WORTH		VALUE BY DISCOUNT RATE		10 % (BENEFITS)
	CAPITAL	O & M		6 % (BENEFITS)	8 % (BENEFITS)	(COSI)	(COSI)	
1 1987	4.680	0.0	-4.680	4.680	0.0	4.680	0.0	4.680
2 1988	34.630	0.0	-34.630	30.821	0.0	29.690	0.0	28.620
3 1989	253.330	0.0	-253.330	212.701	0.0	201.102	0.0	190.351
4 1990	198.400	0.0	-198.400	157.152	0.0	145.830	0.0	135.510
5 1991	89.850	2.330	-88.300	68.883	2.899	62.236	2.681	57.237
6 1992	69.260	3.110	-68.750	51.018	9.602	45.506	8.583	40.851
7 1993	86.110	3.980	-83.180	58.915	17.897	52.567	15.702	46.231
8 1994	122.620	5.470	-90.090	80.366	23.591	69.203	20.314	59.755
9 1995	58.030	6.630	-41.920	38.272	31.217	32.346	26.383	27.422
10 1996	11.230	6.870	5.420	10.107	41.054	8.384	34.054	6.978
11 1997	5.620	8.850	74.340	1.623	46.784	6.206	38.089	31.128
12 1998	0.900	9.850	86.830	5.342	48.495	4.269	38.751	31.092
13 1999	0.620	10.330	90.010	5.134	47.335	4.026	37.123	31.172
14 2000	0.350	10.450	92.060	4.777	45.496	3.677	35.020	28.844
15 2001	0.210	10.490	92.840	4.465	43.246	3.373	32.672	25.662
16 2002	0.140	13.020	90.670	3.841	40.853	2.841	30.307	22.597
17 2003	0.0	10.520	93.310	3.907	38.559	2.843	28.062	20.543
18 2004	0.0	10.520	93.310	3.686	36.377	2.633	25.984	18.675
19 2005	0.0	10.520	93.310	3.477	34.318	2.438	24.059	16.977
20 2006	0.0	10.520	93.310	3.280	32.375	2.257	22.277	15.434
21 2007	0.0	10.520	93.310	3.095	30.543	2.090	20.627	14.031
22 2008	0.0	10.520	93.310	2.919	28.814	1.935	19.099	12.755
23 2009	0.0	10.520	93.310	2.754	27.183	1.792	17.684	11.596
24 2010	0.0	10.520	93.310	2.598	25.644	1.659	16.374	10.542
25 2011	0.0	10.520	93.310	2.451	24.193	1.536	15.161	9.583
26 2012	0.0	13.020	90.810	2.862	22.823	1.760	14.038	8.712
27 2013	0.0	10.520	93.310	2.182	21.532	1.317	12.998	8.020
28 2014	0.0	10.520	93.310	2.058	20.313	1.219	12.036	7.200
29 2015	0.0	10.520	93.310	1.942	19.163	1.129	11.144	6.662
30 2016	0.0	18.650	85.180	3.247	18.078	1.853	10.319	5.951
31 2017	0.0	18.950	84.880	3.113	17.055	1.744	9.554	5.410
32 2018	0.0	10.520	93.310	1.630	16.090	0.896	8.846	4.918
33 2019	0.0	24.040	79.790	3.514	15.179	1.897	8.191	4.471
34 2020	0.0	18.380	85.450	2.535	14.320	1.343	7.584	4.064
35 2021	0.0	10.520	93.310	1.369	13.509	0.712	7.023	3.625
36 2022	0.0	13.020	90.810	1.598	12.745	0.815	6.502	3.359
37 2023	0.0	10.520	93.310	1.218	12.023	0.610	6.021	3.054
38 2024	0.0	10.520	93.310	1.149	11.343	0.555	5.575	2.776
39 2025	0.0	10.520	93.310	1.084	10.701	0.523	5.162	2.524
40 2026	0.0	10.520	93.310	1.023	10.095	0.484	4.780	2.294
41 2027	0.0	10.520	93.310	0.965	9.524	0.448	4.425	2.086
42 2028	0.0	10.520	93.310	0.910	8.985	0.415	4.098	1.896
43 2029	0.0	10.520	93.310	0.859	8.476	0.384	3.794	1.724
44 2030	0.0	10.520	93.310	0.810	7.996	0.356	3.513	1.567
45 2031	0.0	10.520	93.310	0.764	7.544	0.330	3.253	1.425
46 2032	0.0	13.020	90.810	0.892	7.117	0.318	3.012	1.295
47 2033	0.0	10.520	93.310	0.680	6.714	0.283	2.789	1.177
48 2034	0.0	10.520	93.310	0.642	6.334	0.262	2.582	1.070
49 2035	0.0	10.520	93.310	0.605	5.975	0.242	2.391	0.973
50 2036	0.0	10.520	93.310	0.571	5.637	0.224	2.214	0.885
TOTAL	935.980	494.500	436.480	812.827	985.763	716.808	670.810	475.245

BENEFIT/COST RATIO BY DISCOUNT RATE (B/C) = 1.21 (6%), 0.94 (8%), 0.74 (10%)
 INTERNAL RATE OF RETURN (IRR) = 7.5 %

Table XI-1-28 PROJECT COST AND BENEFITS, SENSITIVITY ANALYSIS, CASE 9

(UNIT: MILLION BAHT)

YEAR	PROJECT COST		BENEFITS		RETURN	6 %		8 %		10 %	
	CAPITAL	O & M	TOTAL	(BENEFITS)		(COST)	(BENEFITS)	(COST)	(BENEFITS)	(COST)	(BENEFITS)
1 1987	4,680	0.0	4,680	0.0	-4,680	4,680	0.0	4,680	0.0	4,680	0.0
2 1988	34,630	0.0	34,630	0.0	-34,630	30,821	0.0	29,690	0.0	28,620	0.0
3 1989	253,330	0.0	253,330	0.0	-253,330	212,701	0.0	201,102	0.0	190,331	0.0
4 1990	198,400	0.0	198,400	0.0	-198,400	157,152	0.0	145,830	0.0	135,510	0.0
5 1991	89,850	2,330	92,180	5,260	-86,920	68,883	3,931	62,736	3,580	57,237	3,266
6 1992	69,260	9,110	72,370	16,880	-55,490	51,018	11,900	45,606	10,637	40,851	9,528
7 1993	76,110	3,980	90,090	30,780	-59,310	59,915	20,471	52,567	17,960	46,231	15,795
8 1994	122,620	5,470	128,090	40,280	-87,810	80,366	25,272	69,203	21,762	59,755	18,791
9 1995	58,030	6,630	64,660	56,620	-8,040	38,272	33,514	32,346	28,324	27,422	24,013
10 1996	11,230	6,870	18,100	81,000	62,900	10,107	45,230	8,384	37,519	6,978	31,229
11 1997	5,620	8,850	14,470	98,300	83,830	7,623	51,784	6,206	42,159	3,012	34,967
12 1998	0.900	9,850	10,750	109,740	98,990	5,342	54,538	4,269	43,580	3,425	34,967
13 1999	0.620	10,330	10,950	118,030	107,080	5,134	55,338	4,026	43,400	3,172	34,189
14 2000	0.350	10,450	10,800	125,840	115,040	4,777	55,660	3,677	42,844	2,844	33,138
15 2001	0.210	10,490	10,700	132,500	121,800	4,465	55,288	3,373	41,770	2,562	31,720
16 2002	0.140	13,020	13,160	138,070	124,910	5,180	54,352	3,841	40,302	2,864	30,048
17 2003	0.0	10,520	10,520	141,600	131,080	3,907	52,586	2,843	38,270	2,081	28,015
18 2004	0.0	10,520	10,520	143,060	132,540	3,686	50,121	2,633	35,801	1,892	25,731
19 2005	0.0	10,520	10,520	143,460	132,940	3,477	47,416	2,438	33,242	1,720	23,457
20 2006	0.0	10,520	10,520	143,460	132,940	3,280	44,732	2,257	30,779	1,564	21,325
21 2007	0.0	10,520	10,520	143,460	132,940	3,095	42,200	2,090	28,500	1,422	19,386
22 2008	0.0	10,520	10,520	143,460	132,940	2,919	39,812	1,935	25,388	1,292	17,624
23 2009	0.0	10,520	10,520	143,460	132,940	2,754	37,538	1,792	24,434	1,175	16,022
24 2010	0.0	10,520	10,520	143,460	132,940	2,598	35,432	1,659	22,624	1,068	14,565
25 2011	0.0	10,520	10,520	143,460	132,940	2,451	33,427	1,536	20,948	0,971	13,241
26 2012	0.0	13,020	13,020	143,460	130,440	2,862	31,535	1,760	19,396	1,092	12,037
27 2013	0.0	10,520	10,520	143,460	132,940	2,182	28,750	1,317	17,960	0,802	10,943
28 2014	0.0	10,520	10,520	143,460	132,940	2,058	28,066	1,219	16,829	0,730	9,948
29 2015	0.0	10,520	10,520	143,460	132,940	1,942	26,477	1,129	15,397	0,663	9,044
30 2016	0.0	18,650	18,650	143,460	124,810	3,247	24,979	1,853	14,257	1,069	8,222
31 2017	0.0	18,950	18,950	143,460	124,510	3,113	23,565	1,744	13,201	0,987	7,474
32 2018	0.0	10,520	10,520	143,460	132,940	1,630	22,231	0,896	12,223	0,498	6,795
33 2019	0.0	24,040	24,040	143,460	119,420	3,514	20,973	1,897	11,318	1,035	6,177
34 2020	0.0	18,380	18,380	143,460	125,080	2,535	19,785	1,343	10,479	0,719	5,616
35 2021	0.0	10,520	10,520	143,460	132,940	1,369	18,666	0,712	9,703	0,374	5,105
36 2022	0.0	13,020	13,020	143,460	130,440	1,598	17,609	0,815	8,984	0,421	4,641
37 2023	0.0	10,520	10,520	143,460	132,940	1,218	16,612	0,610	8,319	0,309	4,239
38 2024	0.0	10,520	10,520	143,460	132,940	1,149	15,672	0,565	7,703	0,281	3,836
39 2025	0.0	10,520	10,520	143,460	132,940	1,084	14,785	0,523	7,132	0,256	3,487
40 2026	0.0	10,520	10,520	143,460	132,940	1,023	13,948	0,484	6,604	0,232	3,170
41 2027	0.0	10,520	10,520	143,460	132,940	0,965	13,159	0,448	6,115	0,211	2,882
42 2028	0.0	10,520	10,520	143,460	132,940	0,910	12,414	0,415	5,662	0,192	2,620
43 2029	0.0	10,520	10,520	143,460	132,940	0,859	11,711	0,384	5,242	0,175	2,382
44 2030	0.0	10,520	10,520	143,460	132,940	0,810	11,048	0,356	4,854	0,159	2,155
45 2031	0.0	10,520	10,520	143,460	132,940	0,764	10,423	0,330	4,494	0,144	1,958
46 2032	0.0	13,020	13,020	143,460	130,440	0,892	9,833	0,378	4,162	0,162	1,789
47 2033	0.0	10,520	10,520	143,460	132,940	0,880	9,276	0,283	3,853	0,119	1,627
48 2034	0.0	10,520	10,520	143,460	132,940	0,642	8,751	0,262	3,568	0,108	1,479
49 2035	0.0	10,520	10,520	143,460	132,940	0,605	8,256	0,242	3,304	0,099	1,344
50 2036	0.0	10,520	10,520	143,460	132,940	0,571	7,789	0,224	3,059	0,090	1,222
TOTAL	935,980	494,500	1,430,480	5828,680	4,398,200	832,827	1277,873	716,908	858,440	641,670	600,696

BENEFIT COST RATIO BY DISCOUNT RATE (B/C) = 1.57 (6%), 1.20 (8%), 0.94 (10%)
 INTERNAL RATE OF RETURN (IRR) = 9.5 %

XI-2. Financial Analysis

Table XI-2-1. Farm Budget By Farm Size, Paddy Farm

Items	Small		Medium		Large	
	Without Project	With Project	Without Project	With Project	Without Project	With Project
Family Size(Persons)	4.8		5.0		6.3	
No of Family Labor Force(Persons)	2.8		3.0		3.5	
Ave. Farm Size (ha)						
- Paddy	1.0	1.2	1.6	1.8	2.6	2.8
- Fallow	0.2	-	0.3	0.1	0.3	0.1
- Total	1.2	1.2	1.9	1.9	2.9	2.9
Planted Area (ha)						
- Paddy	1.0	1.2	1.6	1.8	2.6	2.8
- Field Crops	-	0.3	-	0.5	-	0.7
- Fruit, Forage	-	-	-	-	-	0.1
- Total	1.0	1.5	1.6	2.3	2.6	3.6
Gross Income (₹)						
Farm						
- Paddy	5,650	14,100	9,000	21,150	14,650	32,900
- Field Crops	-	8,350	-	13,950	-	19,500
- Fruit, Forage	-	-	-	-	-	4,650
- Livestock	5,000	6,000	5,000	6,000	7,000	8,000
- Sub. Total	10,650	28,450	14,000	41,100	21,650	65,050
Off-Farm	10,000	10,000	10,000	10,000	8,000	8,000
Total	20,650	38,450	24,000	51,100	29,650	73,050
Production Cost (₹)						
Farm						
- Paddy	1,300	3,200	2,100	4,850	3,400	7,500
- Field Crops	-	1,000	-	1,650	-	2,300
- Fruit, Forage	-	-	-	-	-	150
- Livestock	1,500	1,800	1,500	1,800	2,100	2,400
- Sub-Total	2,800	6,000	3,600	8,300	5,500	12,350
Net Income (₹)	17,850	32,450	20,400	42,800	24,150	60,700

Note: Exclusive of family labor cost

Table XI-2-2. Farm Budget By Farm Size, Rubber/Paddy Farm

Items	Small		Medium		Large	
	Without Project	With Project	Without Project	With Project	Without Project	With Project
Family Size(Persons)	5.0		5.2		6.1	
No of Family Labor Force(Persons)	3.1		3.4		3.8	
Ave. Farm Size (ha)						
- Paddy	0.7	0.8	1.0	1.2	1.0	1.3
- Rubber,Upland	0.6	0.6	1.0	1.0	2.0	2.0
- Fallow	0.1	-	0.2	-	0.5	0.2
- Total	1.4	1.4	2.2	2.2	3.5	3.5
Planted Area (ha)						
- Paddy	0.7	0.8	1.0	1.2	1.0	1.3
- Rubber	0.6	0.6	1.0	1.0	2.0	2.0
- Field Crops	-	0.2	-	0.3	-	0.3
- Fruit, Forage	-	-	-	-	-	0.1
- Total	1.3	1.6	2.0	2.5	3.0	3.7
Gross Income (K)						
Farm						
- Paddy	3,950	9,400	5,650	14,100	5,650	15,300
- Rubber	7,500	10,150	12,500	16,900	24,950	33,750
- Field Crops	-	5,550	-	8,350	-	8,350
- Fruit, Forage	-	-	-	-	-	4,650
- Livestock	6,000	7,000	5,000	6,000	4,000	5,000
- Sub. Total	17,450	32,100	23,150	45,350	34,600	67,050
Off-Farm	8,000	8,000	8,000	8,000	10,000	10,000
Total	25,450	40,100	31,150	53,350	44,600	77,050
Production Cost (K)						
Farm						
- Paddy	900	2,150	1,300	3,200	1,300	3,500
- Rubber	3,000	4,250	5,000	7,050	10,000	14,150
- Field Crops	-	650	-	1,000	-	1,000
- Fruit, Forage	-	-	-	-	-	150
- Livestock	1,800	2,100	1,500	1,800	1,200	1,500
- Sub-Total	5,700	9,150	7,800	13,050	12,500	20,300
Net Income (K)	19,750	30,950	23,350	40,300	32,100	56,750

Note : Exclusive of family labor cost

APPENDIX XII. PRESENT POSITION OF THE TO DAENG SWAMP

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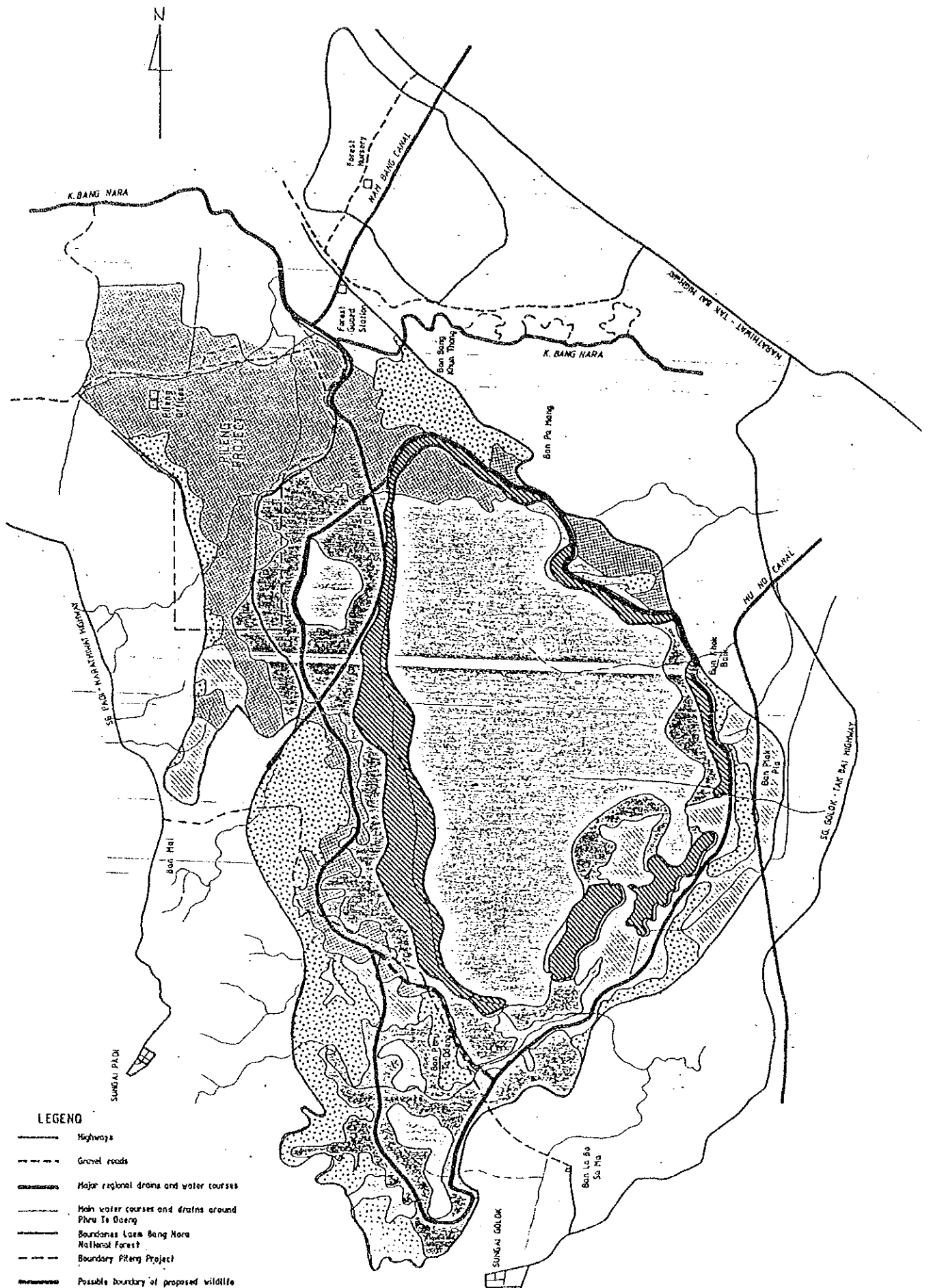
1. GENERAL

The To Daeng swamp lying in the north-eastern part of Amphoe Sungai Padi and in the south of Mae Nam Bang Nara, southern part of Amphoe Tak Bai is an extensive inland freshwater forested peat swamp that is the largest remaining one in Thailand. It is indicated that the To Daeng peat swamp forest originally covered over 200 sq.km, but the area had been reduced to 125 sq.km by 1980. It continues that further reduction has occurred due to a major fire in the 1983 early dry season, and the undisturbed forested area is presently approximated at 90 sq.km although the exact boundary of the remaining undisturbed area has not yet been given.
















It is explained that the swamp was formed under prograding shoreline conditions with a brackish water herbaceous marsh, with subsequent gradual transition to a freshwater forested swamp sand ridges or mounds which are seen on the swamp's marginal locations are similar in geology to the sandy upland area bordering the northern fringes of the swamp and may be an evidence of the former beaches or delta formations. Samples of the swamp peats varying in depth from 30 to 150 cm are composed of both brackish and fresh water plant species.

The To Daeng swamp has officially been gazetted as Laem Bang Nara II Forest Reserve by RFD National Reserve Forest Management and Watershed Management Divisions and also as Laem Bang Nara II National Forest by RFD Forest Herbarium and National Parks Division. Its area is also included within the designated Non-Hunting Area administered by RFD Wildlife Conservation Division.

The exclusive nature of the To Daeng swamp with the great interest in its conservation has been recognized by RFD, DLD and NEB for the past 10 years. Several conservation groups in particular, Thai "Man and Biosphere Committee" under the auspices of UNESCO has expressed the desirability of preserving the To Daeng swamp and this view is being supported by the lobbying of Thai Government agencies including world



LEGEND

-  Highways
-  Gravel roads
-  Major regional drains and water courses
-  Main water courses and drains around Phru To Daeng
-  Boundaries Loam Bang Nora
-  National Forest
-  Boundary Piling Project
-  Possible boundary of proposed wildlife sanctuary (preservation and conservation zone)
-  Possible cut-off boundary for area of marginal ecological value
-  Undisturbed core area of swamp forest
-  Areas of degraded swamp forest
-  Degraded swamp forest areas for possible afforestation
-  Native grass / sedge swamp
-  Areas subject to recent land development for agriculture
-  Established agricultural areas

experts in rainforest ecology. In addition, internationally leading bio-chemical and chemical research companies have expressed to RFD scientific interest related to the variety and possible genetic varieties of plant communities of the To Daeng peat swamp forest.

2. EXISTING FLORA AND FAUNA

2.1 FLORA

The present peat swamp forest is composed of the following ecosystems:

- (1) an arboreal core area of peat swamp forest characterized by a three stories tree cover with dominant species such as "upper canopy", "mid-canopy" and "lower-canopy".
- (2) transitional sub-dominant forests characterised by palms in wetter areas.
- (3) fringe forests dominant in areas where excessive moisture, sandy soils and/or high groundwater tables exist.
- (4) native grassy marsh lands.
- (5) severely disturbed forest and/or grassy marsh lands.

RFD's Forest Herbarium Staff has conducted plant inventory survey in the To Daeng swamp during the dry season of 1984 and 1985. It is expected that the plant identification and documentation are complete in October 1985. The importance of To Daeng swamp to Thailand is primarily due to the presence of rare plant species and to the largest peat swamp forest in the nation. It has been reported that the RFD's Forest Herbarium Staff found six plant species previously not recorded in Thailand in March 1984.

Some of the rare or economic plants particularly palms, rattans, epiphytes and ground plants are exploited for making poles and charcoal for sale to the middlemen who transport these products using boats down the Mae Nam Bang Nara system or trucks by road from Ban Pileng as well as for gathering minor forest products for mat-wearing and ornamental plants.

2.2 FAUNA

Existing documentation of the wildlife resources in the To Daeng swamp has concentrated on the bird life, and the swamp provides the breeding and home range habits for some of the Thailand's rarer bird species including many of those species protected by the non-hunting area. In addition, the local indications are that there is an extensive diversity of the wildlife species, some of which are considered to be rare in Thailand including tiger, slow loris and gharial.

Extent of illegal poaching of wildlife species such as tortoises, cobras, frogs, primates and birds is difficult to assess, but it is common knowledge that some of them are trapped or shot by local people for sale to local urban areas. Together with the reduction of habitat, it is considered that the continuing viability of some species would be in doubt.

It is also reported that the fishing occurs along the main watercourses using stringer set lines, single pole set lines, fish traps and nets, and the main species being caught and sold to the local middlemen are Pla chon-snakehead and Pla Duck-catfish.

RFD's Wildlife Conservation Division considers that a priority is given to the completion of comprehensive wildlife survey and then to the justification for declaration of the To Daeng swamp as Wildlife Sanctuary.

3. EXISTING EXPLOITATION

As mentioned previously, the extent of To Daeng peat swamp forest has been reduced by an estimated 35-40 percent over the past 20-25 years. The initial intrusions 15 to 25 years ago were into the adjacent upland ridges associated with the surrounding fringe forests and grassy marsh lands in northern and eastern sectors of the swamp. More recently, major drainage including the Sg.Padi diversion drain. Pileng drainage scheme and improvements to Khlong Nam Baeng (Khlong Pileng diversion) together with the road construction has facilitated an access to previously inaccessible parts of the western sector of the swamp.

At present, the exploitation of forest and fishery resources as well as the land clearing in the swamp are being undertaken during the months of January to March, and the fires lit at temporary camps and for land clearing are often left unattended resulting in large-scale uncontrolled peat and forest fires in most of the areas west of Sg.Padi diversion drain and south of the swamp-Ban Lu Bo Sa Ma road.

A critical situation exists, with the core areas of undisturbed swamp forests being surrounded by the areas which have been burnt over and are currently subject to the accumulation of fallen trees due to windthrow. This "flash fuel" accumulation above ground level makes these areas vulnerable to either accidental with sparks from adjacent fires or purposeful lighting.

4. LAND ZONING

The general area covering the To Daeng swamp has been designated for a number of purposes as follows:

- (1) Laem Bang Nara II National Forest (RFD).
- (2) Laem Bang Nara Non-Hunting AREA (RFD).

- (3) Area of the Royal Assent for Pileng land settlement development (RID & CPD)
- (4) Parts of other projects such as Mu No project (RID) and His Majesty's Plak Pla livestock project (LDD).

In addition, illegal agricultural intrusions including villages, rubber plantations and paddy land development have occurred on all sides within the National Forest boundary.

Rationalization of the present land use and status as well as setting of new boundaries to delineate the preservation and conservation zones are a priority. Some of the discussions about this land zoning have been made in which the GRBDS-Environmental Study Report (April, 1985) indicates the following designation of each zone with suggested land use:

- P1 - Preservation Zone which is the core area of undisturbed lowland swamp forest, fringe forest communities and marshlands forming the ecosystem to be designated as a wild life sanctuary.
- C1 - Priority Conservation Zone where afforestation is undertaken to establish a buffer zone to protect the preservation zone.
- C2 - Secondary Conservation Zone where tree replanting is promoted; however, the limited land use as swamp meadows on a least or permit basis is acceptable.
- C3 - Tertiary Conservation Development Zone where much of the land is used for agriculture with mitigating actions and controls to complement the management of P1, C1 and C2 zones, for which land titles are eventually issued with the deletion from the National Reserve Forest status.

5. PRESENT SITUATION OF THE WATER LEVEL

The GRBDS report explains from the observations in the To Daeng swamp, the discussions with local residents and the consideration of extent of the downstream flooding the following :

- Seasonal fluctuation of the surface water level in the To Daeng swamp is approx. 1 to 1.5 m.
- The swamp is subject to the elevated groundwater levels for 2 to 3 months with a gradual lowering over the period of February to April, and the present swamp ecosystem could withstand the near-surface groundwater levels for the extended period.
- During the peak flood flow, the maximum indicated level in the swamp is in the order of 1.5 to 2 m.

The GRBDS report further refers to the drainage from the To daeng swamp:

- A) Khlong To Daeng drains the area near Sg.Padi, flows north-east through the southern end of the To Daeng swamp, crosses the Mu No canal and continues on to Mae Nam Kolok. Drainage from the To Daeng swamp is naturally to the north-east; however, the Mu No canal intercepts these flows and takes them north to Mae Nam Pu Yu and Mae Nam Bang Nara, on extension of which additional drainage has been provided by construction of the Nam Baeng channel to the ocean.
- B) GRBDS report on Water Resources and Flood Mitigation (Vol.2) describes the present flood mechanism of the Mu No region by observing the 1983 flood by members of the Australian Study Team.

- Inflow to the Mu No area was composed of Khlong To Daeng (estimated peak flow of 250 cu.m per sec), overspill from Mae Nam Kolok, runoff from the To Daeng swamp plus water from Mae Nam Kolok entering the area via the Mu No canal.
- Drainage in the Mu No area was insufficient to operate such large flows resulting in extensive flooding. The Mu No canal does not have the capacity to manage the local drainage; hence, the local flooding occurred early in the flood.
- Immediately after the gates of the Mu No canal were opened, the banks of the canal were overtopped and water was spilled both westwards and eastwards. Much of water on the west side of the canal flowed to the north and into Mae Nam Bang Nara. On the east side of the canal flows were to the north-east, back to Mae Nam Kolok although high levels in the river restricted flows.

6. WATER STORAGE AT TO DAENG SWAMP

6.1 BACKGROUND

The GRBDS Team carried out, at the request of RID, a study on use of the To Daeng swamp for water storage to control the floods and to release the irrigation water during the dry season.

The To Daeng swamp forest has been receding with the illegal clearing and burning of the forest as well as the reduction of water level due to over drainage. This over drainage results in the reduction of peat thickness, the exposure of plant root zones and the easier access to swamp for intruders. The reduction in peat layer thickness results in the increased depth of flooding. The proposed bund for water storage will protect the swamp from over drainage, and provide a barrier to the intrusion into the swamp.

6.2 SWAMP TOPOGRAPHY

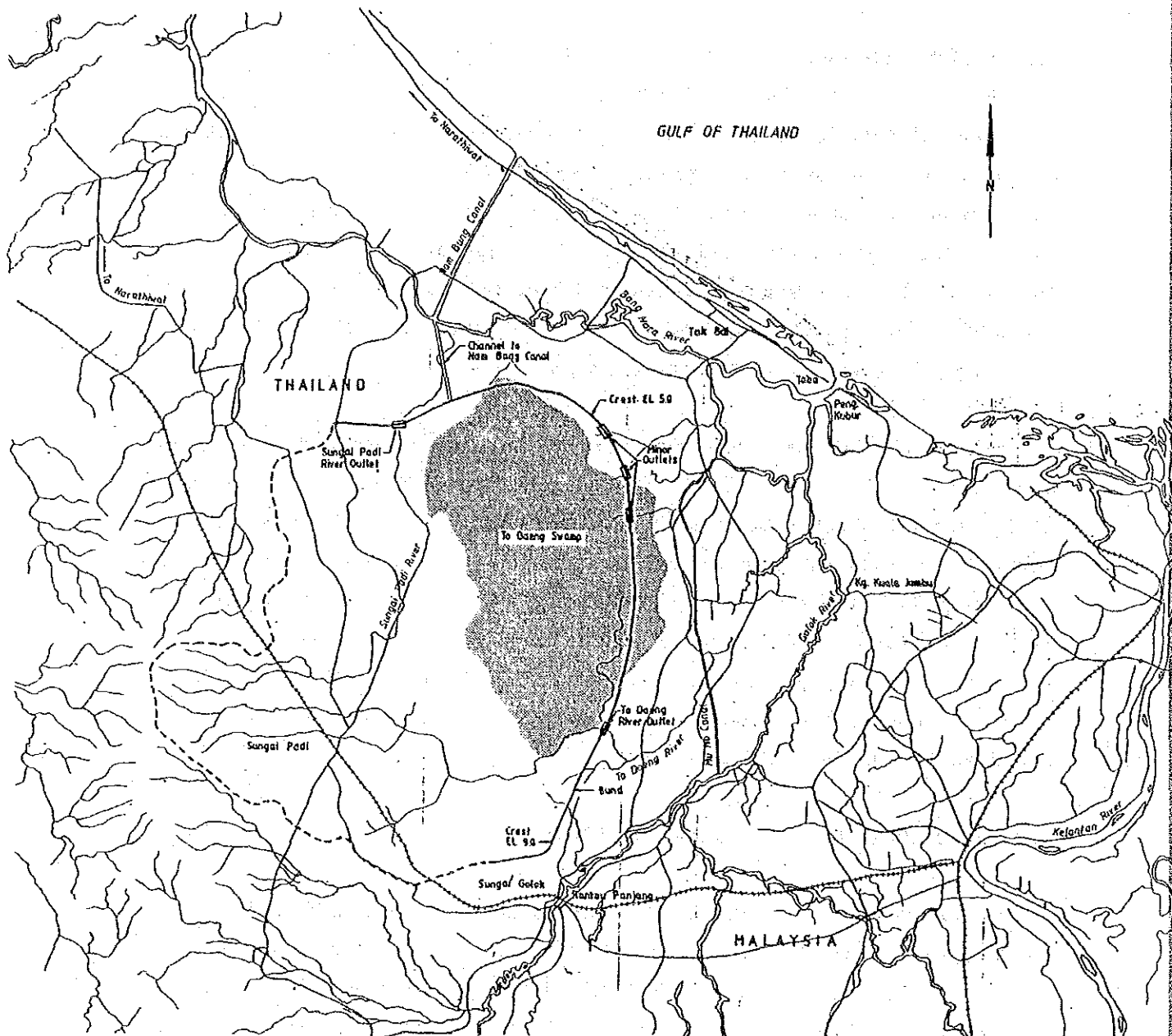
The 1:10,000 scale orthophotomaps prepared by RTSD in 1984 on the basis of the 1982-June photography compile the topographical features in and around the swamp. It has been explained that only 5 m-contour lines were produced photogrammetrically and 1 m-contours then were interpolated. When such contours are compared with those as compiled in the RTSD topographical maps at a scale of 1:25,000, both are identical in terms of elevation and location.

The orthophotomaps indicate that the ground level within the To Daeng swamp is approx. El 7 m in its southern end and is decreasing to El 1.5 m in its north-east section. Drainage is generally to the northeast across the swamp. Streams from the low hills around Sg.Padi and the paddy fields west of the swamp drain through the swamp and emerge on the northeast side as sheet flooding during heavy rains. There are low flat plains between the To Daeng swamp and Mae Nam Kolok which are composed of marshy and unproductive near the swamp and then are used for paddy cultivation closer to kolok.







6.3 BUND LOCATION AND STORAGE CAPACITY

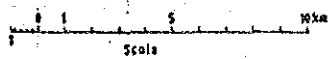
A next page shows the bund location proposed by GRBDS, taking advantage of small rises on the ground level and avoiding the disruption of settled areas. The proposed bund which are located around the eastern side of the To Daeng swamp will contain all the small streams which flow into the swamp with a catchment of 330 sq.km.

The maximum storage is limited to EL 4.0 m by the level of paddy fields north of Sg.Padi on the western side of the To Daeng swamp. The minimum operating level of EL 2.5 m is given taking the minimum level of the swamp at EL 2.0 m with an allowance for a channel slope of 1:10,000 between the bund and the ocean.



LEGEND

-  Bund
-  Catchment area boundary
-  Gate
-  Swamp
-  Road
-  Railway



<u>Water Level</u> (EL-m)	<u>Area</u> (sq.km)	<u>Volume</u> (10 ⁶ cu.m)	
1.0	0	0	
2.0	25.2	9.9	
2.5	38.7	25.9	
4.0	100.7	126.0	diff. 100x10 ⁶ cu.m.
5.0	122.0	237.0	

6.4 FLOOD MITIGATION

The flood inflow estimated is given below :

<u>Return Period</u> (yrs.)	<u>Peak Flow</u> (cu.m per sec)	<u>Flood Volume</u> (10 ⁶ cu.m.)
5	410	119
10	550	160
25	680	200
50	800	235

(catchment = 300 sq.km)

The proposed storage of 100x10⁶ cu.m is insufficient to accommodate all the flood flow during a 10-year flood, and when the storage releases water of 110 cu.m per sec, such flood could be fully stored. Water will be released into Mae Nam Bang Nara so that the present flood water to the Mu No and Ko Sathon where the severe inundation is seen could be diverted away. The storage commence to fill as soon as the flood exceeds 110 cu.m per sec, fill over the duration of the flood and then gradually empty after the flood inflow reduces to less than 110 cu.m per sec. Under this situation, the water level in the storage would be raised for a total of 16 days, and this could invite the damage of vegetation within the swamp.

6.5 WATER SUPPLY

The water storage for dry season release is possible being opposed to the temporary storage for flood mitigation. The water supply storage is always kept as full as possible, and when a flood comes later in the monsoon period, the storage is already full with a minor flood mitigation.

The regulated outflow from the total storage of 100×10^6 cu.m is approx 5 cu.m per sec which is sufficient for 6,000 ha of the off-season paddy or could be released to maintain the water table in the area adjacent to the bund.

In this case, the vegetation in the swamp would be severely damaged and the rotting vegetation would reduce the water quality to a level unacceptable for irrigation use.

6.6 ENVIRONMENTAL ISSUES

Raising flood levels and extending the flooding duration as well as the magnitude of seasonal fluctuation in surface and groundwater levels which would possibly be brought from the proposed water storage in the To Daeng swamp would have a number of the implications on the remaining undisturbed areas of swamp forest and also result in drastic changes in species composition and most probably dieback in low-lying zones of the storage area especially in the north-east sector where some of the best and most extensive areas of swamp forest are located. Although the To Daeng swamp is a dynamic ecosystem, another stress even with a low level bund would reduce the ecological integrity of the swamp core area including irreversible changes in both the plant and wildlife populations and would finally destroy the present swamp ecosystem.

To this end, the GRBDS report demonstrates that this option with a total initial cost of 540 million Baht is not recommended.

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