

ALTERNATIVE DEVELOPMENT PLAN-4

Irrigation Block	KPS	①	Incremental NPV					(Unit) million Baht
			Cropped Area (ha)	N.P.V per ha 1,000 Baht		Incremental NPV	Incremental NPV	
Season	Crop		w. p	w/o p	Increment			
Wet	Paddy	(T.P)	3.697	2.603	1.094	16.88		
		(B.C)	4.885	3.634	1.251	7.84		
	Total	(21,700)						
	Maize		0.470	-	0.470	1.79		
	Cassava	(-)	-	2.653	2.623	(-) 10.08		
Vegetable	(Exist)	1,800	28.3	21.4	6.9	12.42		
	(New)	600	28.3	-	28.3	16.98		
		(2,400)						
Wets. Total						(45.83)		
Dry	Paddy	(B.C)						
	Soybean		4.097		4.097	4.10		
	Mungbeea		1.059		1.059	1.38		
	Grund nuts		1.805		1.805	2.17		
	Orchard		44.22	-		44.22	70.75	
			500	46.22	12,020	34.20	17.10	
	Cassava	(-)						
	Vegetable		28.3	-		28.3	67.92	
	Paddy (wet)	(-)		2.603		(-) 2.603	4.16	
	Dry. Total						(159.26)	
Grand Total						205.09	= 205	

ALTERNATIVE DEVELOPMENT PLAN-4

Irrigation Block		UPP		Incremental NPV				Incremental NPV	(Unit) million Baht
Season	Crop	Cropped Area (ha)	N.P.V per ha 1,000 Baht		Increment				
			w. p	w/o p	Increment				
Wet	Paddy	(T.P)	3.697	1.617	2.080		54.93		
		(B.C)	4.885	2.648	2.237		13.85		
	Total	(32,600)							
	Maize	4,600	0.470	-	0.470		2.16		
	Cassava	(-) 4,600	-	2.472	2.472		(-) 11.37		
Vegetable	(Exist)	500	28.3	21.4	6.9		3.45		
	(New)	1,200	28.3	-	28.3		33.96		
	(-)	1,200		1.617	(-) 1.617		(-) 1.94		
Wets. Total						(95.04)			
Dry	Paddy	(B.C)	-	-	-				
	Soybean	2,000	4.097	-	4.097		8.19		
	Mungbeea	1,000	1.059	-	1.059		1.06		
	Grund nuts	1,200	1.805	-	1.805		2.17		
	Orchard	3,500	44.200	-	44.200		154.70		
	Cassava	(-) 4,200							
	Vegetable	3,000	28.3	-	28.3		84.90		
	Paddy	(-) 4.70		1.617			(-) 7.60		
Dry. Total						(243.42)			
Grand Total						338.46	= 338		

FIGURE I-2-1 PERCENTAGE OF DROUGHT DAMAGE AREA TO CULTIVATED LAND

(paddy+upland)

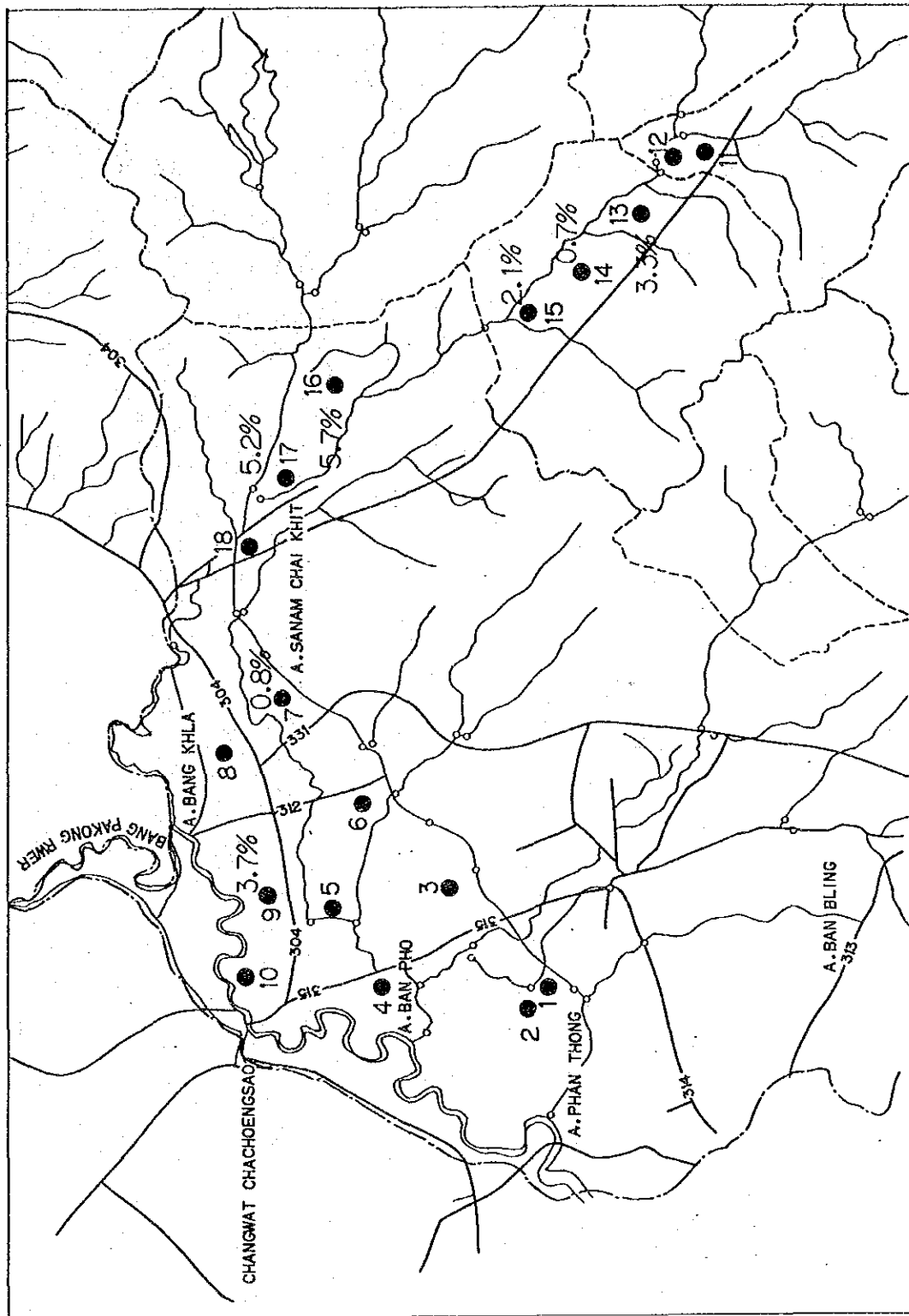


FIGURE I-2-2 PERCENTAGE OF FLOODED AREA TO CULTIVATED LAND

(paddy+upland)

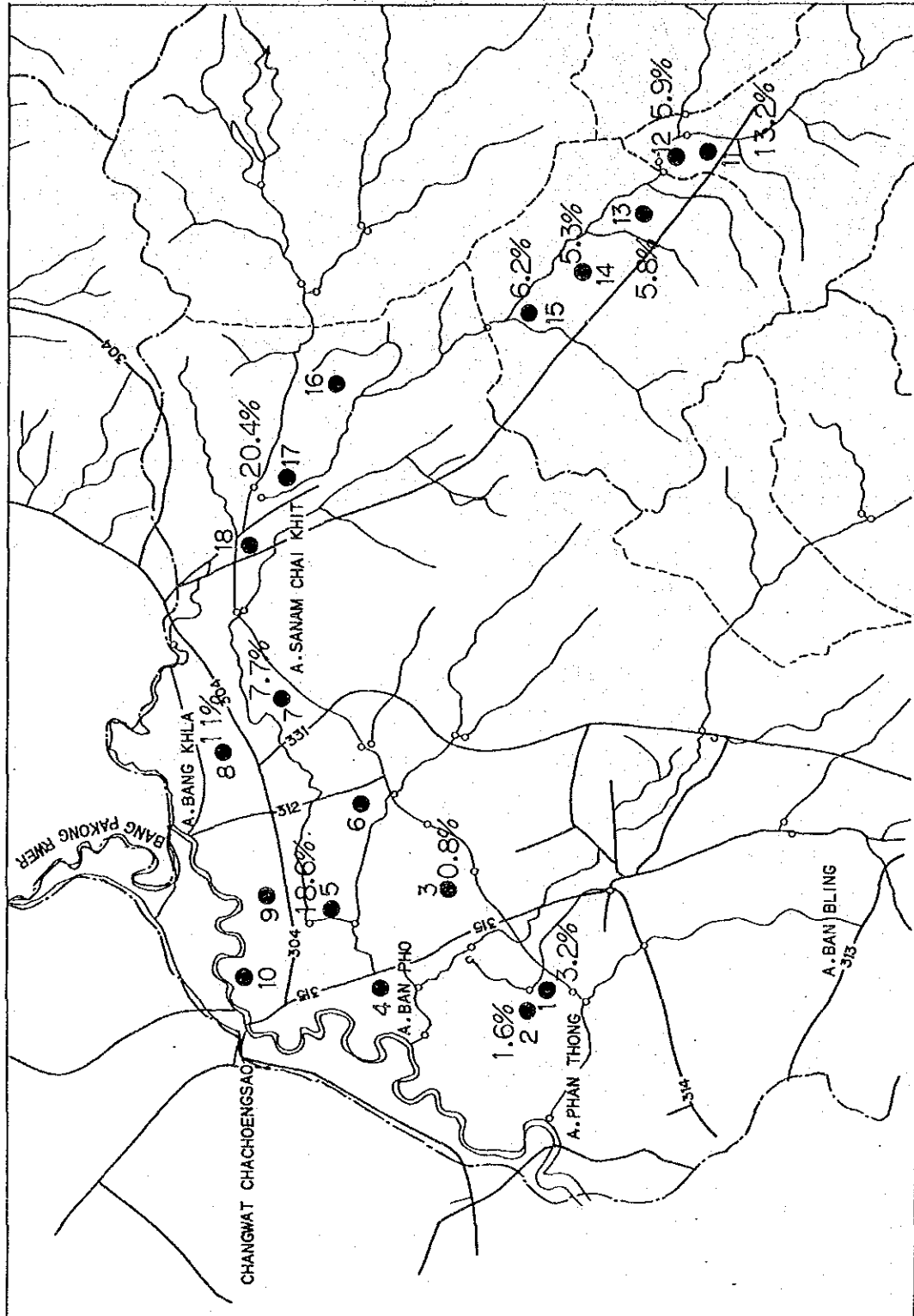


FIGURE I-2-3 PERCENTAGE OF DISEASE/INSECTS AND RATS DAMAGE AREA TO CULTIVATED LAND

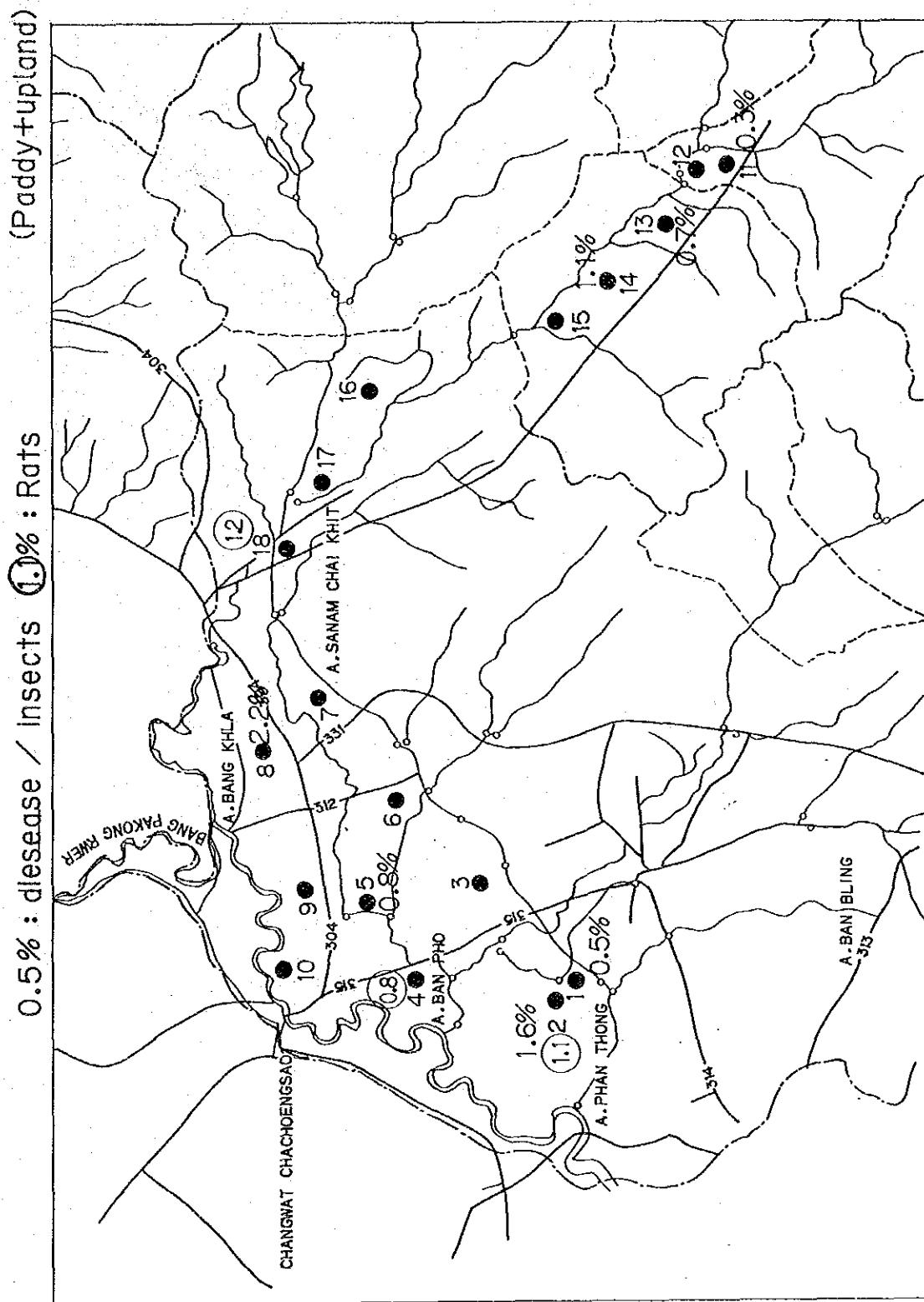


FIGURE I-2-4 AVERAGE CULTIVATED AREA PER FARM-HOUSEHOLD

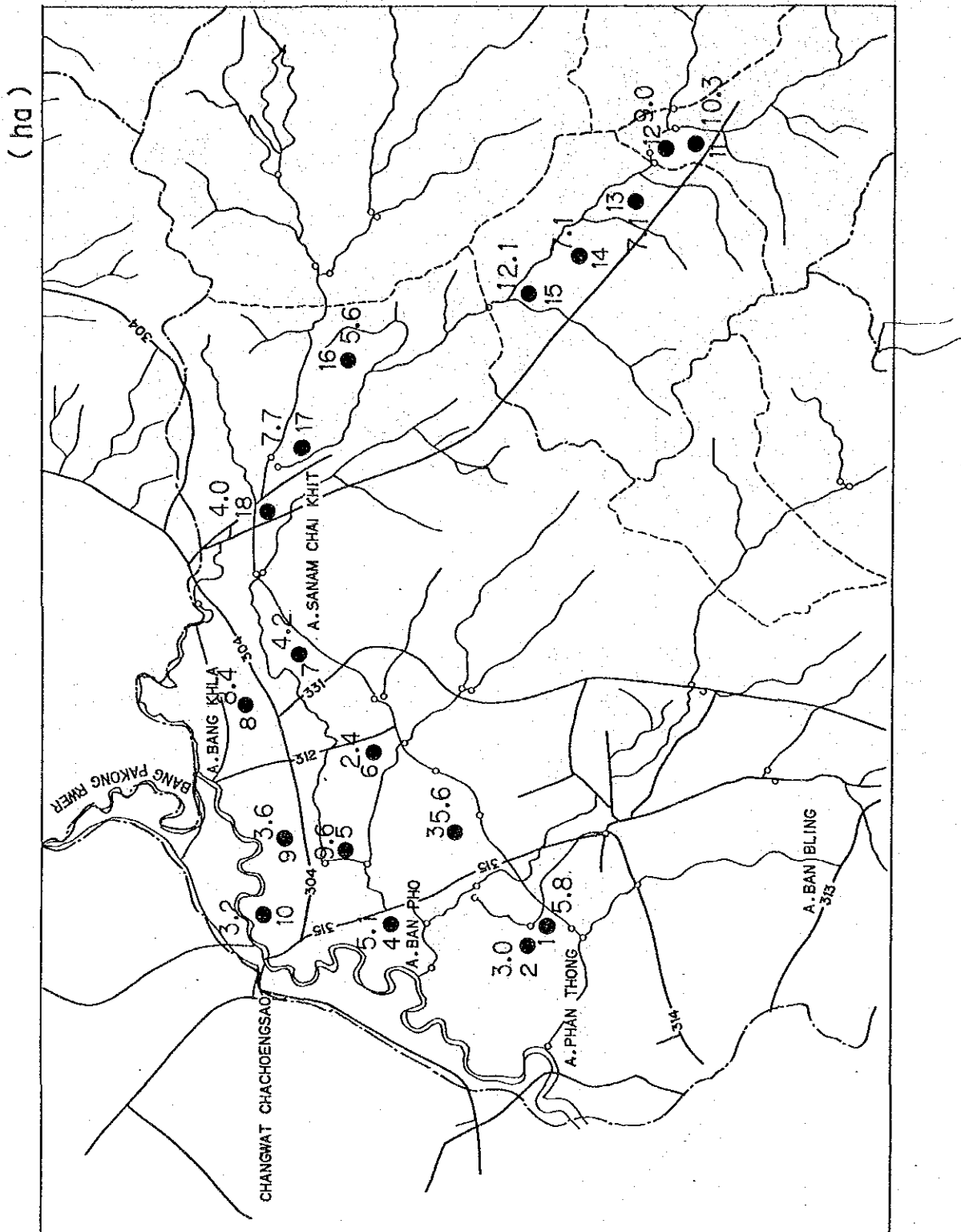
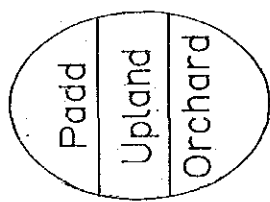
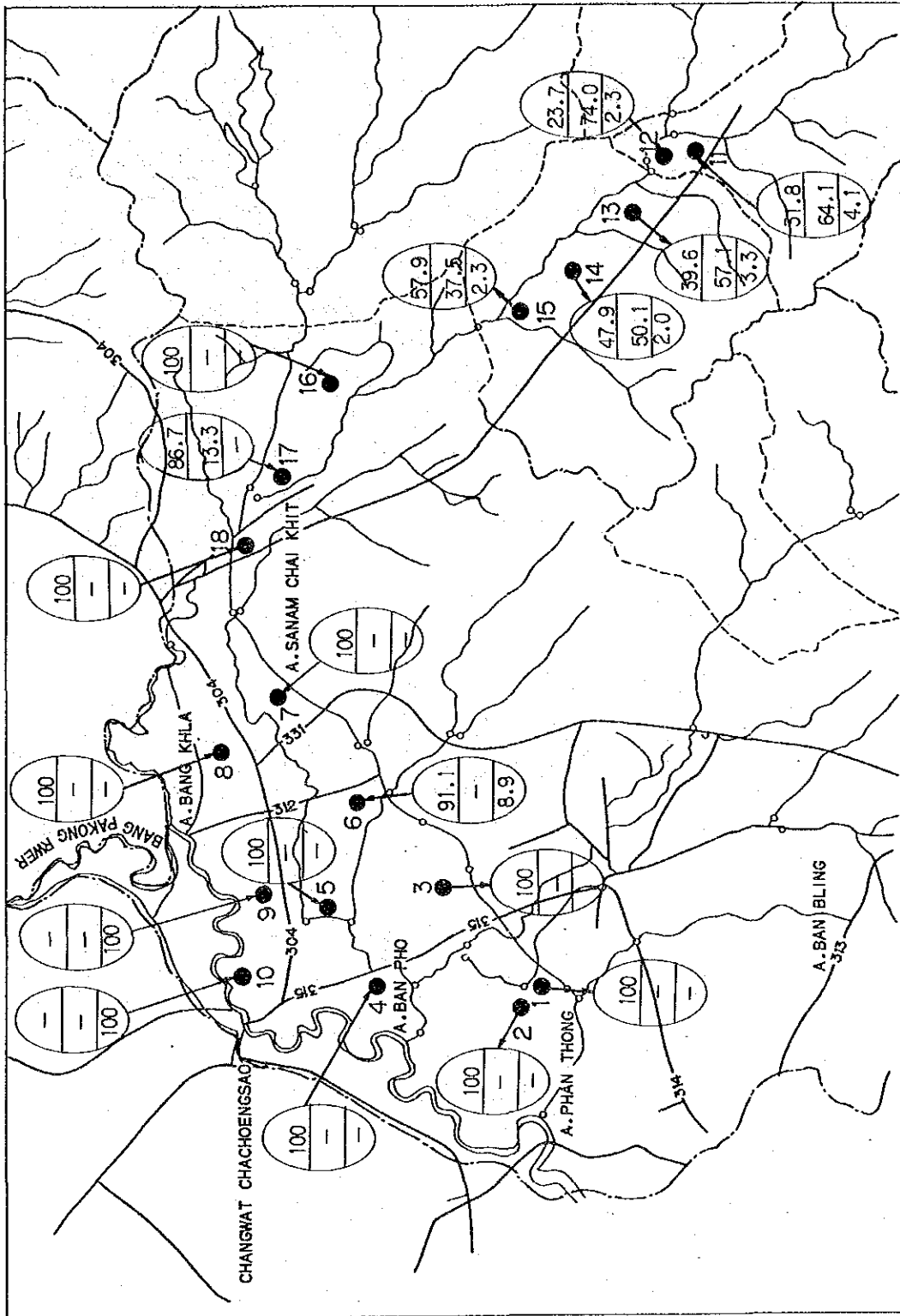


FIGURE I-2-5 PERCENTAGE BY LAND USE



(1,000B)

FIGURE I-2-6 GROSS INCOME OF CROP PER HECTARE

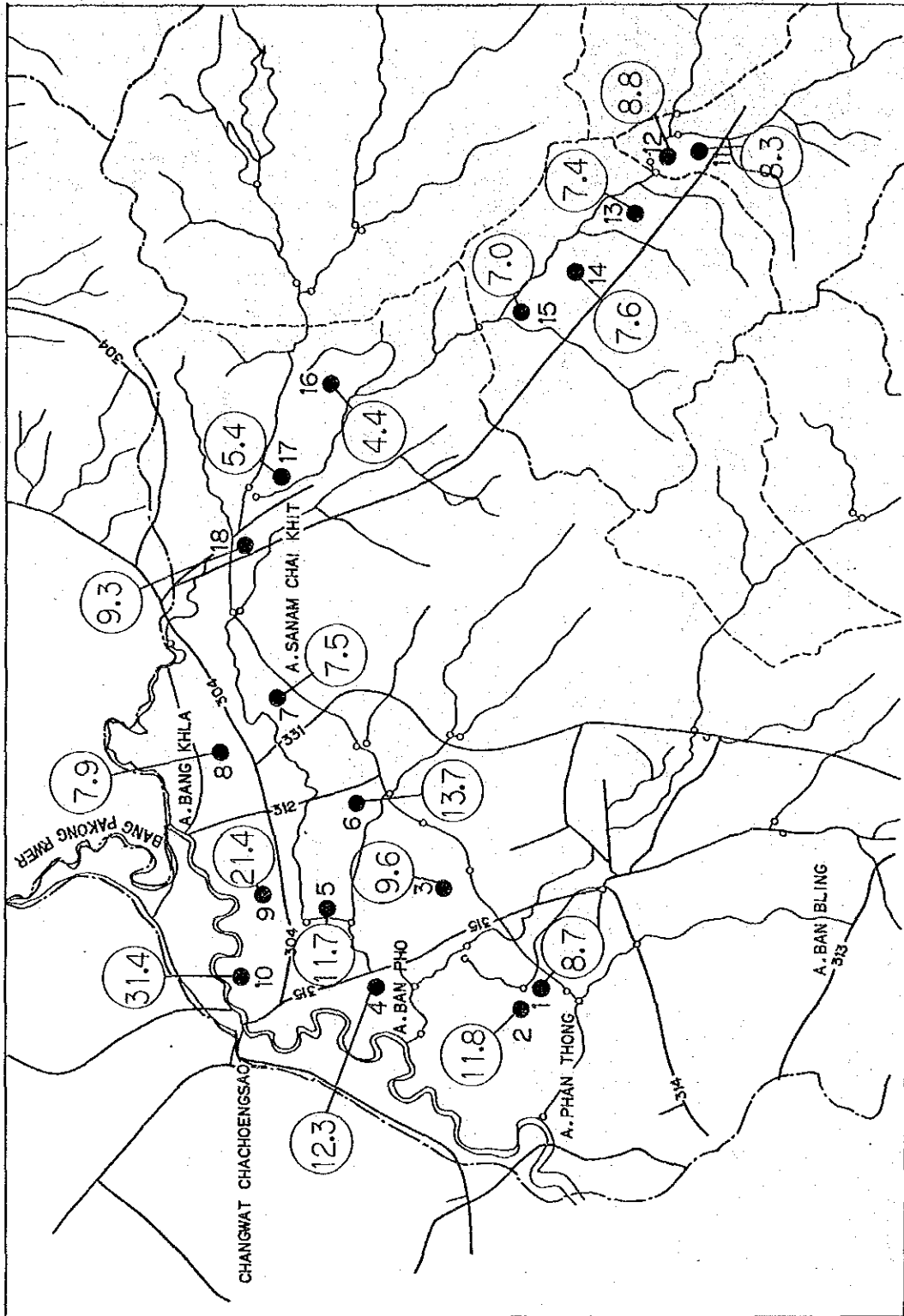


FIGURE I-2-7 TOTAL NET INCOME PER FARM-HOUSEHOLD

(crop+Livestock+Farm hired labor+non-agriculture) (1,000B)

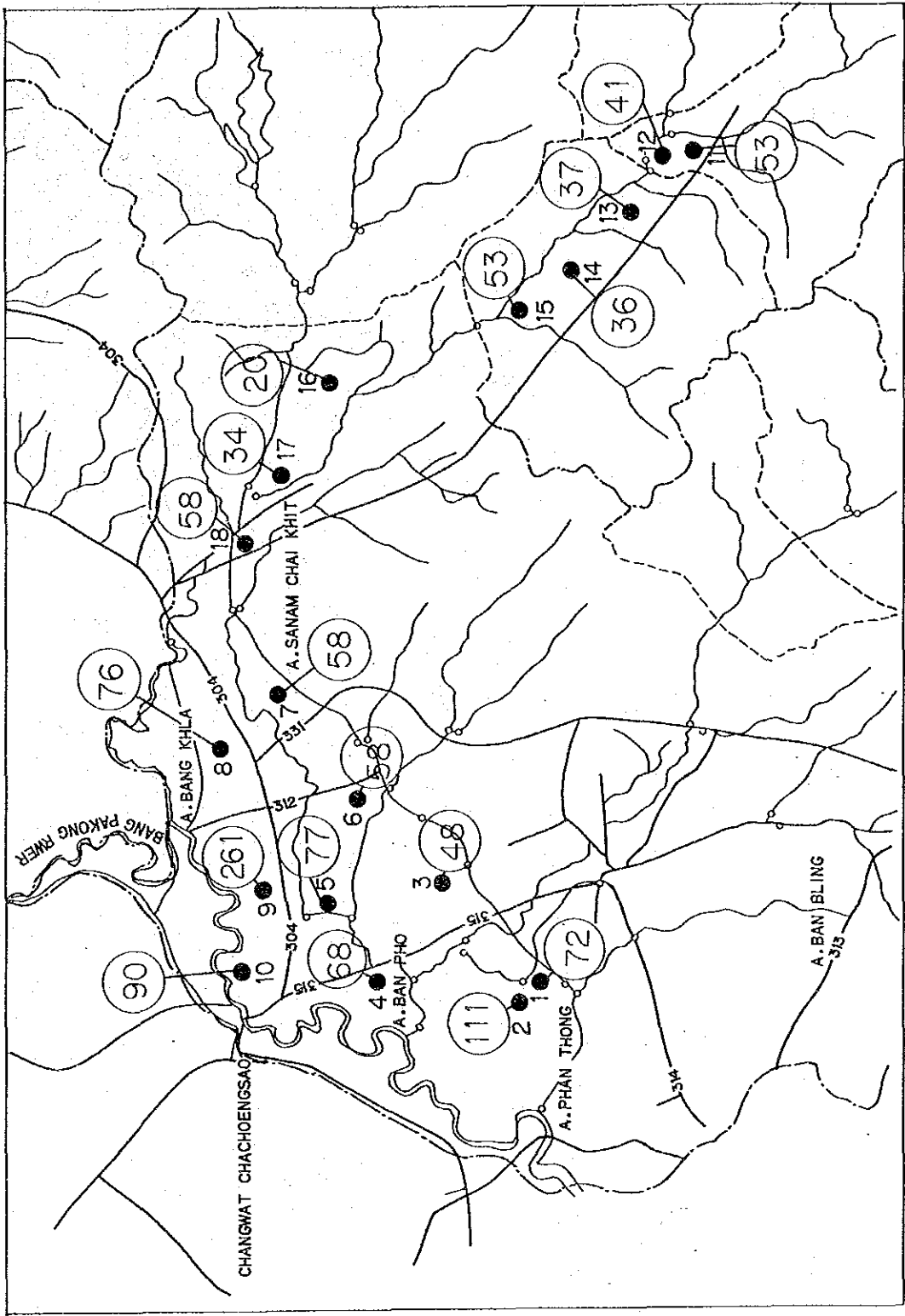


FIGURE I-2-8 PERCENTAGE OF CROP NET INCOME TO TOTAL NET INCOME

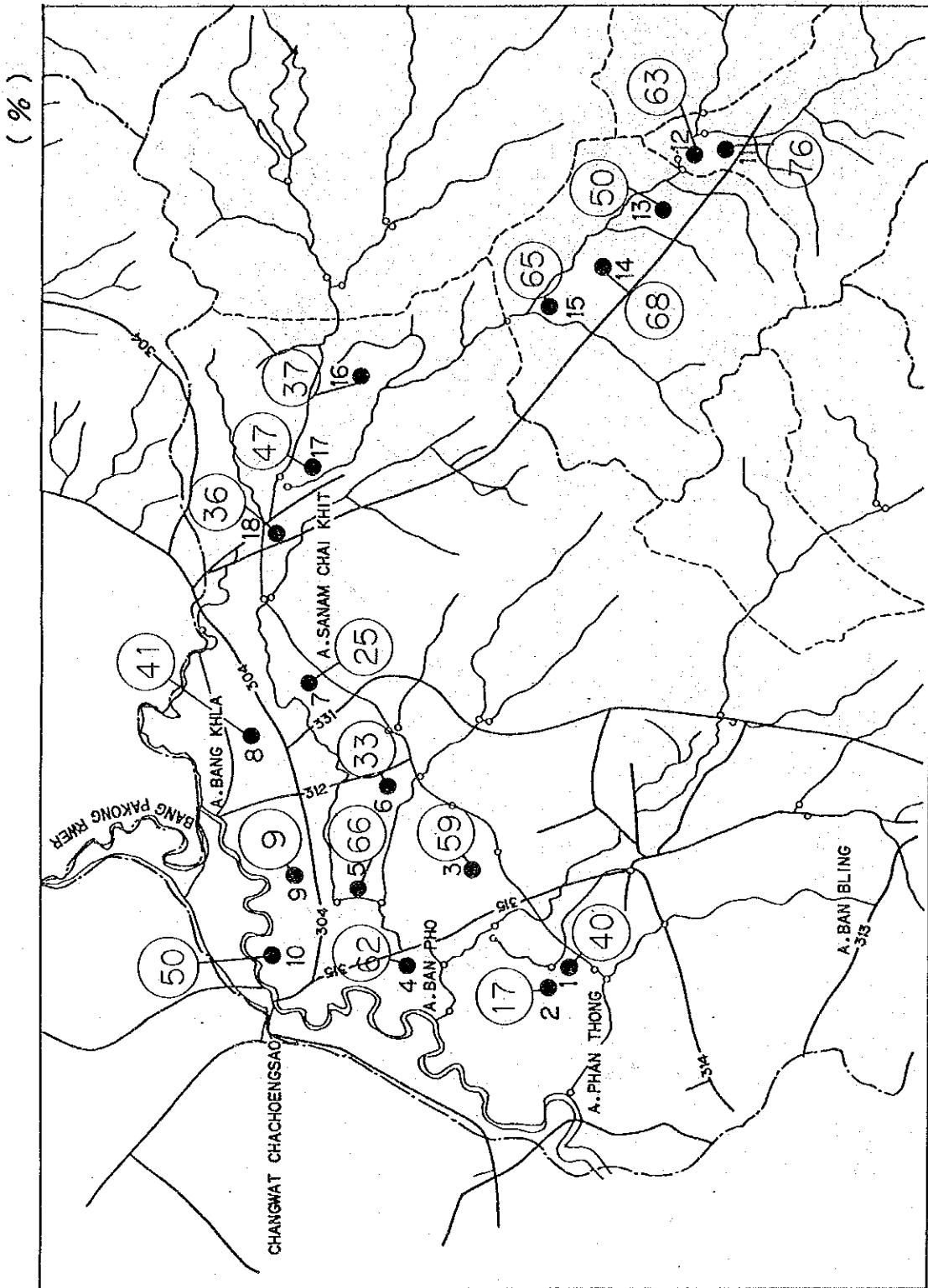


FIGURE I-2-9 PERCENTAGE OF NON-AGRICULTURAL NET INCOME TO TOTAL NET INCOME

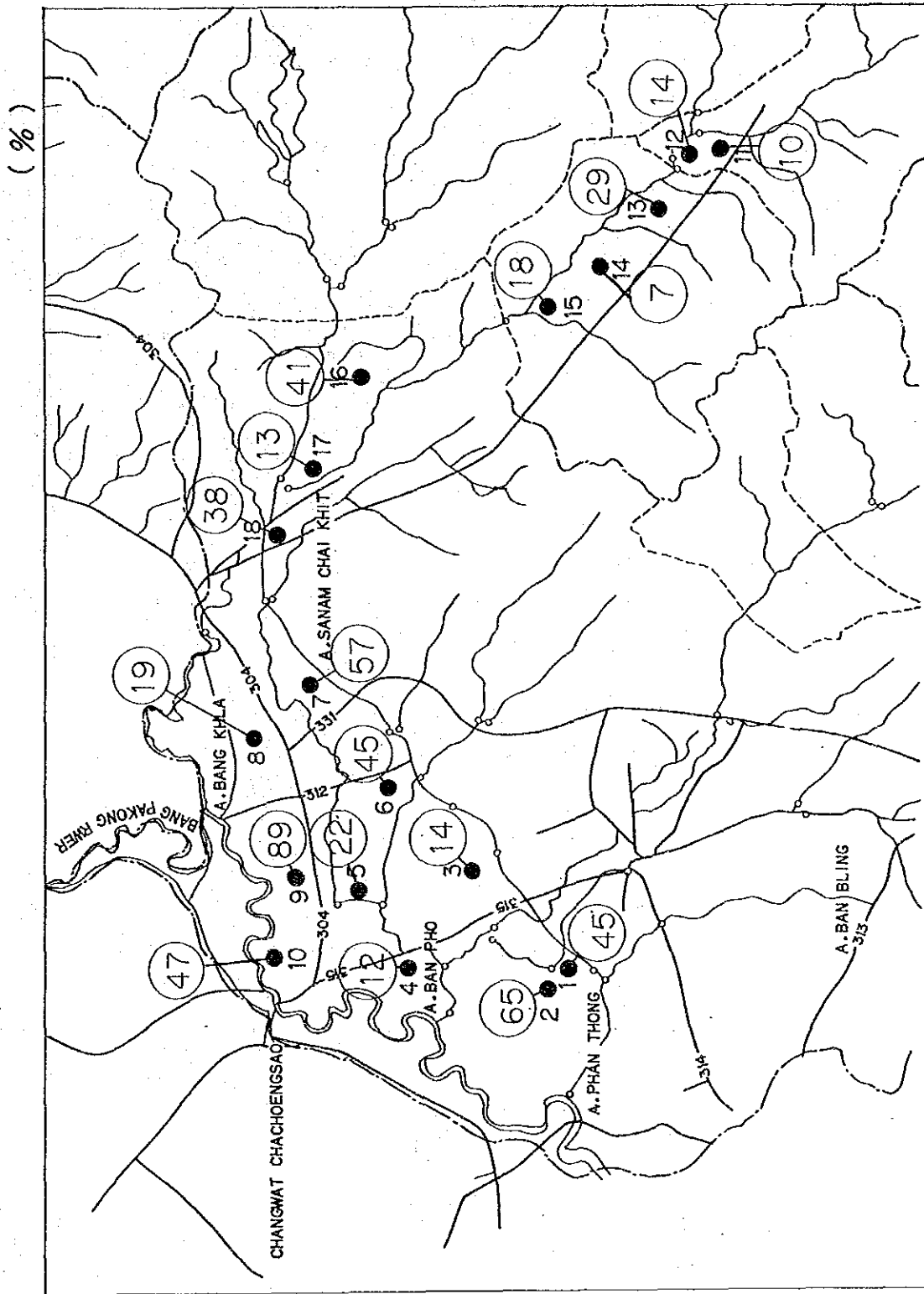


FIGURE I-2-10 NUMBER OF SAMPLE EARNED FROM NON-AGRICULTURAL INCOME

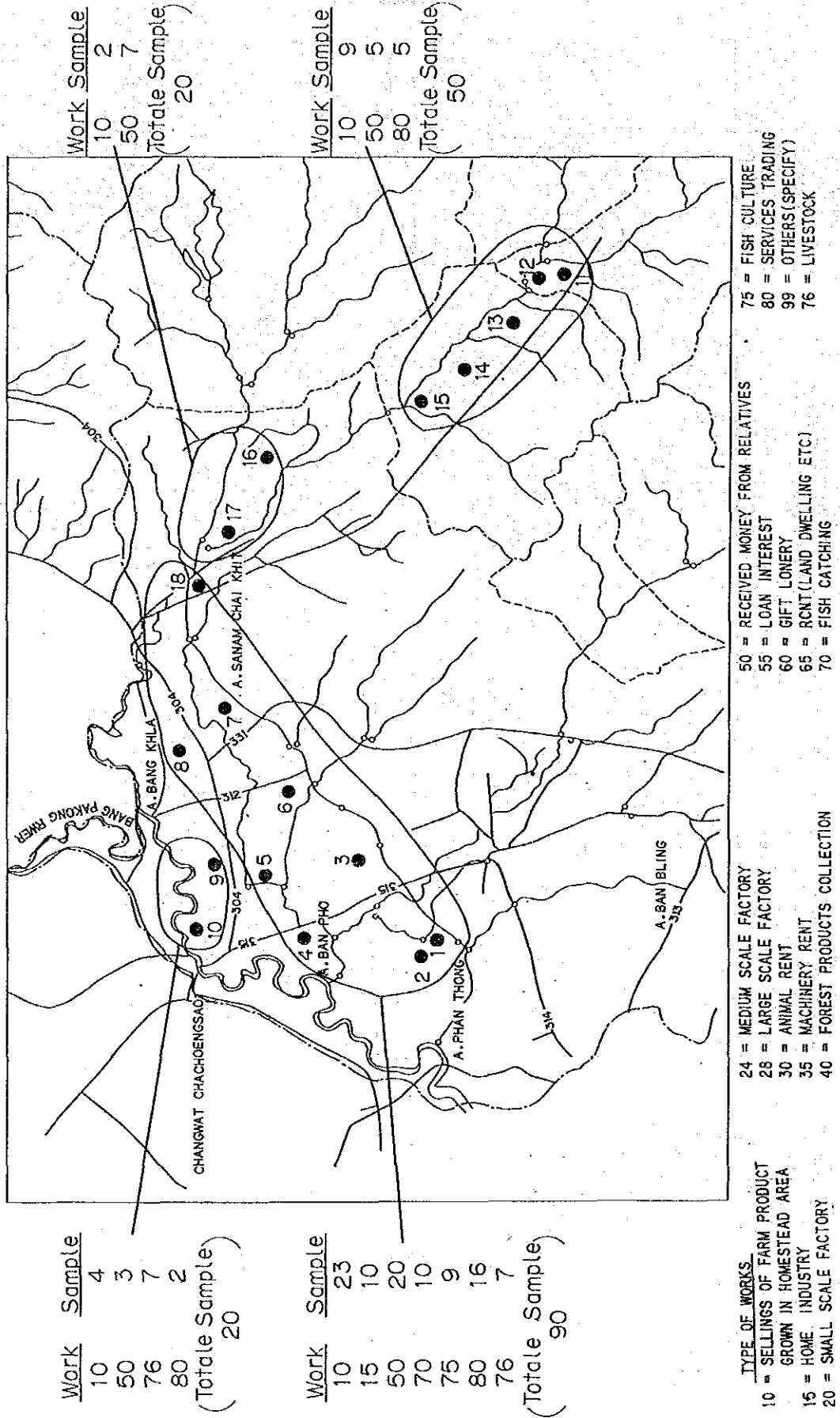


TABLE I-3-1 COMMODITY FINANCIAL PRICES

Item	Unit	Socio-Agro.		Financial (2000)
		Economic Survey (1989)	Other Statistics	
Paddy	Baht/ton	3,726 to 4,595	4,170	2,703
Soybean	"	n.a	8,920	5,725
Mungbean	"	n.a	7,570	7,690
Groundnut	"	n.a	5,000	8,140
Maize	"	2,658		2,310
Cassava	"	647		570
Mango	Baht/kg	6 to 28	5.9to10	5.8
(Vegetable)				
Kale	Baht/ton	10,000	2,500	2,500
Chinese Cabbage	"	n.a	1,500	1,500
Green Bean	"	n.a	4,000	4,000
Tomato	"	n.a	2,000	2,000
Cucumber	"	n.a	2,000	2,000
Watermelon	Baht/one piece	n.a	5,000	5,000
Sweet Corn	Baht/ton	n.a	2,500	2,500
Baby Corn	Baht/kg	n.a	20 (with shell)	20
Pumpkin	Baht/ton	n.a	3,500	3,000
Chilly	"	n.a	4,500	4,500
Kunchai	"	12,800		12,800
(Fertilizer)				
Urea (46%)	Baht/ton	5,700		8,820
DAP(18-46-0)	"			10,800
Potassium	Chloride (60%)			5,815
16-20-0	Baht/ton	4,713	5,500	6,272
15-15-15	"	5,600	5,700	6,735
16-16-16	"	n.a	6,000	7,204
12-24-12	"			7,308
Manure	"		1,800	1,800
Lime	"	n.a	264	264
(Seed)				
Paddy	Baht/kg	4.06 to 4.19		2.5
Maize	"	8.17		2.3
Mungbean	"	48		7.7
Cassava	Baht/1,000 /pc.	42		42
Chinese Kale	Baht/ℓ	75		75
Kunchai	"	94		94
(Chemical)				
Pesticide				
Paddy	Baht/rai	2.0to0.45	180to200Baht/ℓ	180/ℓ
Maize	"	20	180to200Baht/ℓ	180/ℓ
Cassava	"	1.9		180/ℓ
Mango	"	50		180/ℓ
Herbicide				
Paddy	Baht/rai	1.2 to26.9	80Baht/ℓ	80/ℓ
Maize	"	-		
Cassava	"	16.2		
Mango	"	-		

TABLE I-3-1 COMMODITY FINANCIAL PRICES

Item	Unit	Socio-Agro. Economic Survey (1989)	Other Statistics	Financial (2000)
(Machine)				
Hired (Small)				
Paddy	Baht/hour	72 to 119		72 to 119
Maize	"	52		52
Cassava	"	195		195
Mango	"	19		19
Hired (Large)				
Paddy	"	199 to 227		199 to 227
Maize	"	137		137
Cassava	"	260		260
Mango	"	84		84
Fixed Cost				
Tractor	Baht/hour	23		23
Plow	"	27		27
Harrow	"	31		31
Ridger	"	36		36
Sprayer	"	24		24
Thresher	"	14		14
Trailer	"	7		7
(Oil)				
Gasoline	Baht/l	3.9 to 4.2		3.9 to 4.2
Lubricant	"	21 to 23		21 to 23
(Labor)				
Hired labor				
Paddy	Baht/day	64.3 to 78.8		64.3 to 78.8
Maize	"	50		50
Cassava	"	195		195
Mango	"	55.4		55.4

Note: Fixed cost for machine consist of those on repair, interest, tax, insurance and car shed.

TABLE I-3-2 COMMODITY ECONOMIC PRICES

Item	Unit	1989	1995	2000
Paddy	Baht/ton	3,895	3,280	3,280
Soybean	"	9,850	8,630	8,630
Mungbean	"	9,490	7,810	7,810
Groundnut	"	10,185	9,290	9,290
Maize	"	2,745	2,330	2,330
Cassava	"	615	615	615
Mango	"	6,330	6,330	6,330
(Vegetable)				
Kale	Baht/ton	2,300	2,300	2,300
Chinese Cabbage	"	1,380	1,380	1,380
Gree Bean	"	3,680	3,680	3,680
Tomato	"	1,840	1,840	1,840
Cucumber	"	1,840	1,840	1,840
Watermelon	Baht/one piece	4,600	4,600	4,600
Sweet Corn	Baht/ton	2,300	2,300	2,300
Baby Corn	Baht/kg	19	19	19
Pumpkin	Baht/ton	2,760	2,760	2,760
Chilly	"	4,140	4,140	4,140
Kunchai	"	11,760	11,760	11,760
(Fertilizer)				
Urea (46%)	Baht/ton	7,944	8,839	8,359
DAP(18-46-0)	"	8,973	10,083	10,420
Potassium Chloride (60%)		8,817	9,050	9,220
16-20-0	Baht/ton	5,313	5,955	6,095
15-15-15	"	5,826	6,401	6,500
16-16-16	"	6,214	6,827	6,932
12-24-12	"	6,190	6,848	7,111
Manure	"	1,600	1,600	1,600
Lime	"	240	240	240
(Seed)				
Paddy	Baht/kg	3.9	3.3	3.3
Maize	"	2.7	2.3	2.5
Mungbean	"	9.5	7.8	8.7
Cassava	Baht/1,000 /pc.	39	39	39
Chinese Kale	Baht/ℓ	69	69	69
Kunchai	"	86	86	86
(Chemical)				
Pesticide	Baht/ℓ	165	165	165
Herbicide	Baht/ℓ	74	74	74

TABLE I-3-2 COMMODITY ECONOMIC PRICES

Item	Unit	1989	1995	2000
(Machine)				
Hired (Small)				
Paddy	Baht/hour	66 to 110	66 to 110	66 to 110
Maize	"	48	48	48
Cassava	"	180	180	180
Mango	"	17	17	17
Hired (Large)				
Paddy	"	199 to 210	199 to 210	199 to 210
Maize	"	125	125	125
Cassava	"	240	240	240
Mango	"	77	77	77
Fixed Cost				
Tractor	Baht/hour	6.8	6.8	6.8
Plow	"	6.7	6.7	6.7
Harrow	"	8.1	8.1	8.1
Ridger	"	2.3	2.3	2.3
Sprayer	"	4.4	4.4	4.4
Thresher	"	3.2	3.2	3.2
Trailer	"	0.9	0.9	0.9
(Oil)				
Gasoline	Baht/l	3.6 to 3.9	3.6 to 3.9	3.6 to 3.9
Lubricant	"	19 to 21	19 to 21	19 to 21
(Labor)				
unskilled	Baht/day	30	30	30

Note: Fixed cost for machine consist of those on repair, car shed and insurance .

TABLE I-3-3 FINANCIAL AND ECONOMIC PRICE STRUCTURE OF PADDY

-1989 Constant Price-

Item	Unit	1989			1995			2000		
		Financial	Economic	Financial	Economic	Financial	Economic	Financial	Economic	
1) W.B. projection price in 2000 at 1985 Constant price (5% broken white rice, FOB Bangkok)	US\$/ton	203	203	168	168	166	166	166	166	
2) Converted to 1989 constant price	US\$/ton	304	304	251	251	248	248	248	248	
3) Converted to Thai Baht	Baht/ton	7,843	7,843	6,476	6,476	6,398	6,398	6,398	6,398	
4) Adjusted to average grade	Baht/ton	7,610	7,610	6,280	6,280	6,210	6,210	6,210	6,210	
5) Less : Port charge	Baht/ton	200	175 <u>15/</u>	200	175 <u>15/</u>	200	175 <u>15/</u>	200	175 <u>15/</u>	
Rice premium	Baht/ton	350	-	290	-	175	-	175	-	
Exporter tax	Baht/ton	380	-	310	-	190	-	190	-	
Exporter's margin	Baht/ton	400	370 <u>16/</u>	340	310	330	310	330	300 <u>16/</u>	
wholesaler's margin	Baht/ton	200	185 <u>16/</u>	170	155	160	155	160	145 <u>16/</u>	
Transportation Cost										
Bankok to Chachoengasao	Baht/ton	75	65 <u>15/</u>	75	65 <u>15/</u>	75	65 <u>15/</u>	75	65 <u>15/</u>	
6) Ex-mill price of rice	Baht/ton	6,005	6,815	4,895	5,575	5,080	5,575	5,080	5,528	
7) Ex-mill price of paddy	Baht/ton	3,880	4,400	3,265	3,720	3,388	3,720	3,388	3,685	
8) Less : Milling tax	Baht/ton	270	-	230	-	235	-	235	-	
Miller's margin	Baht/ton	270	250 <u>16/</u>	230	210 <u>16/</u>	220	210 <u>16/</u>	220	210	
Merchant's margin	Baht/ton	230	210 <u>16/</u>	200	185 <u>16/</u>	180	185 <u>16/</u>	180	170	
Transport cost farm gate to mill	Baht/ton	50	45 <u>15/</u>	50	45 <u>15/</u>	50	45 <u>15/</u>	50	45	
9) Farm gate price of paddy	-Baht/mt	3,060	3,895	2,555	3,280	2,703	3,280	2,703	3,260	
-US\$/mt	-US\$/mt	119	151	99	127	105	127	105	126	

Note : 1/ Commodity prices and price projections in 1985 constant Dollars, July 11, 1989, IBRD.

2/ G-5, GNP Deflator 1985 = 100, 1989 = 149.55 in Inflation Indices, IBRD

3/ US \$ 1.0 = Baht 25.80

4/ Adjustment ratio is estimated at 97% as the following table.

(Note : Continue)

ESTIMATION OF AVERAGE GRADE TO BE ADJUSTED

Item	- Export Rice -					Average	Grade Adjusted
	1983	1984	1985	1986	1987		
5% Quantity	85,692	84,741	123,005	238,353	258,871		
Value	520,674	493,175	670,424	1,119,740	1,323,040		
Baht/t	6,076	5,891	5,450	4,698	5,111		100
White Rice							
Total							
Quantity	2,576,948	3,414,278	2,877,716	3,613,300	3,244,597		
Value	14,769,172	19,049,973	16,346,317	16,258,840	16,339,061		
Baht/t	5,731	5,580	5,680	4,500	5,036		97
Share of							
5% Quantity	3.3 %	2.5 %	4.3 %	6.6 %	8.0 %		

Source : Agricultural Statistics of Thailand 1989/88, Page 149, MOAC, Thailand

- 5/ Currently Baht 400/mt for 100% and 5%, Baht 350 for 10% and 15%, Baht 250 for 20 % to 45%. This regulation would be improved in future.
- 6/ Export tax is 5% of export price. This rats would be improved in future.
- 7/ Data on business margin is based on the Rice Trading Report, NESDB, 1983. Exporter margin was about 20% of ex-mill price of rice in 1980. But this margin couldn't be realized due to the low FOB price. According to this facts, margin is assumed at about 7% of ex-mill price.
- 8/ According to the Rice Trading Reports, NESDB, 1983, wholesaler margin is assumed at about 3.5% of ex-mill price.
- 9/ From Bangkok to Project Area.
Chachoensago - BKK 127km, Chonburi-BKK50km, Nakhon Nayok-BKK102km.
Prachinburi-BKK 127km, Transportation cost is estimated at 1 Baht/km.
- 10/ Rice Conversion rate classified by size of rice mills are as follows according to the Rice Trading Report, NESDB, 1983.
Small size 64.6%, medium size 66.7%, large size 67.2%.
In this study, the conversion rate of small size is used for 1989, and that of medium sizer 2000.
7% value of ex-mill price of paddy.
- 11/ 7% value of ex-mill price of paddy.
- 12/ Approximately 7% of paddy output before tax.
- 13/ Approximately 7% of import price of paddy at mill.
- 14/ Average distance from project area to mill in Chachoengsao City is assumed at about 50km
- 15/ Conversion factor, 0.87 of transportation is applied.
- 16/ Conversion factor of business margin is applied on standard conversion factor 0.92.

TABLE I-3-4 PRICE STRUCTURE FOR SOYBEAN

- 1989 Constant Price -

Item	Unit	1989		1995		2000	
		Financial	Economic	Financial	Economic	Financial	Economic
1) FOB Bangkok	US\$/ton	471 <u>1/</u>	471	414 <u>2/</u>	414	298 <u>2/</u>	298
2) Converted to Thai Baht	Baht/ton	12,152	12,152	10,681	10,681	7,688	7,688
3) Business tax	"	610	-	535	-	385	-
4) Port handling charge	"	200	175	200	175	200	175
5) Exporter margin	"	540	500	475	437	340	310
6) Wholesale price in Bangkok	"	10,800	11,477	9,470	10,067	6,765	7,203
7) Value adjusted on quality	"	9,720	10,330	8,525	9,060	6,090	6,480
8) Transport/handling Chachoengsao to Bangkok	"	75	60	75	60	76	60
9) Local merchant margin	"	460	420	400	370	290	270
10) Farm gate price of soybean		9,185	9,850	8,050	8,630	5,725	6,150

Year	Quantity MT	Value 1,000 Baht	FOB Baht/MT	Exchange Rate Baht/US\$	FOB US\$/MT	1989 Constant Price
1985	2,342	21,697	9,264	20.65	348 (1.4955)	520
1986	1,983	18,493	9,326	26.13	357 (1.2364)	441
1987	142	1,450	10,211	25.07	407 (1.0975)	447
1988	16	187	11,688	25.24	463 (1.0317)	478
Average						471

Note: 1/ Export value of soybean in Thailand is as follows.

(Agricultural Statistics of Thailand, 1988/89, MOAC, Department of Customs)

Value by year is converted to 1989 constant prices using inflation indices (G-5 GNP Deflator, 1985 = 100), July, 1989, World Bank.
Average FOB price is estimated at 471 US\$/MT.

2/	Year	Soybean Price Projection, IBRD	Soybean Thailand FOB
	1989	207 US\$/t (100)	471 US\$/t
	1995	182 (88)	414
	2000	150 (72)	298

3/ US\$1.0 = Baht 25.80

4/ Business tax is assumed at about 5% of FOB price.

5/ Exporter margin is assumed at about 5% of wholesale price in BKK.

6/ Local merchant margin is assumed at about 5% farm gate price.

TABLE I-3-5 PRICE STRUCTURE FOR MUNGBEAN

- 1989 Constant Price -

Item	Unit	1989		1995		2000	
		Financial	Economic	Financial	Economic	Financial	Economic
1) FOB Bangkok	US\$/ton	456 1/	456	388 2/	388	424 2/	424
2) Converted to Thai Baht	Baht/ton	11,765	11,765	10,010	10,010	10,940	10,940
3) Port handling	"	200	175	200	175	200	175
4) Charges for keeping	"	245	225	245	225	245	225
5) Insurance	"	10	10	10	10	10	10
6) Transport to ship	"	35	30	35	30	35	30
7) Weighing & truck handling	"	30	25	30	25	30	25
8) Exporter margin	"	800	-	800	-	800	-
9) Exporter marketing cost	"	420	385	420	385	420	395
10) Adjustment cost	"	1,050	965	1,050	965	1,050	965
11) Wholesale price, BKK	"	8,975	9,950	7,220	8,195	8,150	9,125
12) Transport Cost Chachoengsao to BKK	"	75	65	75	65	75	65
13) Local merchant margin	"	430	395	345	320	385	355
14) Farm gate price	"	8,470	9,490	6,800	7,810	7,690	8,705

Note: 1/ Export value of mungbean is averaged as follows.

(Agricultural Statistics of Thailand, 1988/89, MOAC, Department of Customs)

Year	Quantity MT	Value 1,000 Baht	FOB Baht/MT	Exchange Rate Baht/US\$	FOB US\$/MT	1989 Constant Price
1984	118,465	1,192,291	10,065	27.15	371	
1985	144,548	1,476,237	10,213	26.65	383	(1.4955) 573
1986	78,787	769,243	9,764	26.13	374	(1.2364) 462
1987	94,719	738,552	7,797	25.07	311	(1.0975) 341
1988	66,106	729,689	11,038	25.24	437	(1.0317) 450
Average			9,760			456

Value by year is converted to 1989 constant prices using inflation indices (G-5 GNP Deflator, 1985 = 100), July, 1989, World Bank.

Average FOB price is estimated at 456 US\$/MT.

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2/ Price projection table by World Bank does not include mungbean. Hence, price projection in 1995, 200 for mungbean is assumed by use of trend of price projection for grian sorghum estimated by Word Bank.

Year	Soybean	
	Price Projection, IBRD	Soybean Thailand FOB
1989	73 US\$/t (100)	456
1995	62 (85)	388 US\$/t
2000	68 (93)	424

3/ US\$1.0 = Baht 25.80

4/ Charges for keeping are those is six months (182 days) at rate 0.067 Baht/bag/day.

5/ Exporter margin consist of interest (16.5%, six month), margin and profit.

6/ Exporter marketing costs are selection of bag at rate of 20 Baht/bag and weight loss 5%.

7/ Adjustment costs are those of bean rejected.

7/ Local merchant margin is about 5% of farm gate price.

TABLE I-3-6 PRICE STRUCTURE FOR GROUNDNUTS (NOT SHELLED)

- 1989 Constant Price -

Item	Unit	1989		1995		2000	
		Financial	Economic	Financial	Economic	Financial	Economic
1) FOB Bangkok	US\$/ton	489 1/	489	445 2/	445	391	391
2) Converted to Thai Baht	Baht/ton	12,616	12,616	11,481	11,481	10,088	10,088
3) Port handling	"	200	175	200	175	200	175
4) Business tax	"	630	-	570	-	500	-
5) Exporter margin	"	560	515	510	470	450	415
6) Wholesale price, BKK	"	12,225	11,925	10,200	10,835	8,940	9,500
7) Value adjusted on quality	"	11,000	10,730	9,180	9,750	8,045	8,550
8) Transport/handling Chachoengsao to BKK	"	75	60	75	60	75	60
9) Local merchant margin	"	525	485	435	400	380	350
10) Farm gate price	"	10,400	10,185	8,670	9,290	7,590	8,140

Note: 1/ Export value of groundnut (not shelled) is averaged as follows.

(Agricultural Statistics of Thailand, 1988/89, MOAC, Department of Customs)

Year	Quantity Not Shelled (MT)	Value Not Shelled (1,000 Baht)	FOB (Baht/MT)	Exchange Rate (Baht/US\$)	FOB	1989 Constant Price (US\$/MT)
1984	435	4,456	10,244	27.15		
1985	418	4,150	9,928	26.65	377	(1,4955) 558
1986	422	4,289	10,164	26.13	373	(1,2364) 481
1987	1,213	10,606	8,744	25.07	389	(1,0975) 383
1988	708	9,251	13,066	25.24	349	(1,0317) 534
Average			10,429		518	489

Value by year is converted to 1989 constant prices using inflation indices (G-5 GNP Deflator, 1985 = 100), July, 1989, World Bank. Average FOB price is estimated at 456 US\$/MT.

2/ Price projection table by World Bank does not include groundnut (not shelled). Hence, price projection in 1995, 2000 for groundnut is assied by use of trend of pice projection of groundnut meal estimated by World Bank..

Year	Soybean	
	Price Projection, IBRD	Thailand FOB
1989	143 US\$/t (100)	489 US\$/t
1995	130 (91)	445
2000	114 (80)	391

3/ US\$1.0 = Baht 25.80

4/ Business tax is assumed at about 5% of FOB prices.

5/ Exporter margin is assumed at about 5% of wholesale price in BKK.

6/ Local merchant margin is assumed at about 5% farm gate price.

TABLE I-3-7 FINANCIAL AND ECONOMIC PRICE STRUCTURE OF MAIZ

- 1989 Constant Price -

Item	Unit	1989		1995		2000	
		Financial	Economic	Financial	Economic	Financial	Economic
1) FOB Bangkok	US\$/ton	126 <u>1/</u>	126	108 <u>2/</u>	108	116 <u>2/</u>	116
2) Converted to Thai Baht	<u>3/</u> Baht/ton	3,250	3,250	2,790	2,790	2,995	2,995
3) Port handling charge	"	200	175	200	175	200	175
4) Exporter margin	<u>4/</u> "	140	130	115	105	125	115
5) Exporter tax	"	160	-	140	-	140	-
6) Wholesale price in Bangkok	"	2,750	2,945	2,335	2,510	2,530	2,705
7) Transport Chachoengsao to BKK	"	75	60	75	60	75	60
8) Truck	"	30	25	30	25	30	25
9) Local merchant margin	<u>5/</u> "	125	115	105	95	115	105
10) Farm gate price	"	2,520	2,745	2,125	2,330	2,310	2,515

Continue (Maize)

Note: 1/ Export value of mungbean is averaged as follows.

(Agricultural Statistics of Thailand, 1988/89, MOAC, Department of Customs)

Year	Quantity Value		FOB Baht/MT	FOB US\$/MT	1989 constant Price
	MT	1,000 Baht			
1984	3,116,483	10,049,816	3,225	119	
1985	2,752,417	7,609,049	2,764	104	(1.4955) 156
1986	3,981,441	9,176,194	2,305	88	(1.2364) 109
1987	1,528,397	3,866,564	2,530	101	(1.0975) 111
1988	1,208,762	3,809,929	3,152	125	(1.0317) 129
<u>Average</u>			<u>2,795</u>		<u>126</u>

Value by year is converted to 1989 constant prices using inflation indices (G-5 GNP Deflator, 1985 = 100), July, 1989, World Bank.
Average FOB price is estimated at 456 US\$/MT.

2/ Price projection for Maize, FOB, BKK is assumed by use of trend of price projection for US Maize, No.2. yellow, FOB, Gulf Parts estimated by World Bank.

Year	Yellow Maize		Maize Thailand FOB
	USA, IBRD	USA, IBRD	
1989	79 US\$/MT (100)	126 US\$/MT	
1995	68 US\$/MT (.86)	108 US\$/MT	
2000	73 US\$/MT (.92)	116 US\$/MT	

3/ US\$1.0 = Baht 25.80

4/ Exporter margin is assumed at about 5% of sholesale price in BKK.

5/ Local merchant margin is assumed at about 5% farm gate price.

TABLE I-3-8 PRICE STRUCTURE FOR MANGO

- 1989 Constant Price -

Item	Unit	1989	
		Financial	Economic
1) FOB Bangkok	US\$/ton	323 <u>1/</u>	323
2) Convert to Thai Baht	Baht/ton	8,333 <u>2/</u>	8,333
3) Port handling - transport BKK to part, handling and vanning to boat	"	500	435
4) Certification fee	"	100	-
5) Cargo damaged loss	"	400 <u>3/</u>	370
6) Exporter tax	"	420 <u>4/</u>	-
7) Exporter margin	"	450 <u>5/</u>	400
8) Wholesaler margin	"	220 <u>6/</u>	200
9) Wholesale price in BKK	"	6,460	6,930
10) Transport Cost Chachoengsao to BKK	"	100	90
11) Packing Cost	"	560 <u>7/</u>	510
12) Farm gate price	"	5,800	6,330

Note : 1/ Export value of fresh mango is averaged as follows.

Year	Quantity MT	Value 1,000Baht	FOB Baht/MT	Exchange rate Baht/US\$	Fob US\$/MT	1989 Constant	
						Price	US\$/MT
1984	3,175	31,256	9,844	27.15	363		
1985	8,311	57,170	6,879	26.65	258	(1.4955)	386
1986	9,400	54,287	5,775	26.13	221	(1.2304)	273
1987	3,736	28,309	7,577	25.07	302	(1.0975)	331
1988	6,713	49,727	7,408	25.24	294	(1.0317)	303
<u>Average</u>			<u>7,497</u>				<u>323</u>

Source : Agricultural Statistics of Thailand, 1988/89, MOAC, Department of Custom

2/ US\$ 1.0 = Baht 25.80

3/ Cargo damaged loss is assumed at 5% of ex-Port price.

4/ Exporter tax is assumed at 5% of FOB price.

5/ Exporter margin is assumed at 7% of wholesale price in BKK

6/ Wholesale margin is assumed at 3.5% of wholesale price in BKK.

7/ Packing cost include carton box and labor.

mango packing standard is medium size (net weight 6.8 - 7.5 kg)

140 box per ton × 4 Baht = 560 Baht

TABLE I-3-9 PRICE STRUCTURE FOR CASSAVA

Item		1989	
		Financial (Baht/ton)	Economic (Baht/ton)
1) Pallets, FOB, Bangkok	<u>1/</u>	3,140	3,140
2) Business tax		55	-
3) Exporter's cost and margin	<u>2/</u>	140	130
4) Pellets' delivered godown price		2,945	3,010
5) Delivering cost to godown		40	35
6) Pelletizing cost		100	92
7) Fille cost		30	28
8) Saving on chip requirement		50	45
9) Pelleter's margin		50	45
10) Chips, delivered pelletiser		2,675	2,765
11) Transport		210	185
12) Chips pre-delivered to pellerer		2,465	2,580
13) Chippers margin	<u>3/</u>	615	645
14) chips after dring		1,850	1,935
15) Cost of root weight loss (60%)		1,110	1,160
16) Chipping cost		10	9
17) Transportation cost farm-gate to chip mill		150	130
18) Root fresh farm-gate price			
Chachoengsao		570	615

Note : 1/ Average price Jan. to Nov. 1989, Office of Agri.Economics
 2/ 4.5% of FOB price
 3/ 25% of chips pre-delivered to pelleter

TABLE I-3-10 PRICE STRUCTURE FOR UREA (N : 46%)

Item	Unit	1989		1995		2000	
		Financial	Economic	Financial	Economic	Financial	Economic
1) FOB, Urea, NW Europe in 1985 constant price ^{1/}	US\$/ton	119	119	141	141	130	130
2) Converted to 1989 constant price ^{2/}	US\$/ton	178	178	211	211	194	194
3) Freight (US\$70) & insurance	US\$/ton	74	74	74	74	74	74
4) CIF price at Bangkok port	Baht/ton	252	252	285	285	268	268
5) Convert to Thai Baht	Baht/ton	6,500	6,500	7,355	7,355	6,915	6,915
6) Commission fee	Baht/ton	15	14	15	14	15	14
7) Taxes Expenses	Baht/ton	115	-	180	-	125	-
8) Port Expenses	Baht/ton	320	295	365	335	340	295
9) Godown Expenses	Baht/ton	60	55	60	55	60	55
10) Import / factory price	Baht/ton	7,010	6,864	7,925	7,759	7,455	7,279
11) Marketing costs and margins	Baht/ton	100	90	100	90	100	90
a. Transport costs		90	80	90	80	90	80
b. Storage costs		200	185	200	185	200	185
c. Bagging costs		200	185	200	185	200	185
d. Handling costs		40	35	40	35	40	35
e. Physical losses		110	-	110	-	110	-
f. Taxes, levies, custom duties		35	-	35	-	35	-
g. Interest charges		100	90	100	90	100	90
h. Other costs		35	30	35	30	35	30
i. Importers margin		180	165	180	165	180	165
j. Wholesale margin		245	225	245	225	245	225
k. Retail margin		(1,335)	(1,055)	(1,335)	(1,055)	(1,335)	(1,055)
12) Transport cost from farm to shop	Baht/ton	30	25	30	25	30	25
13) Farm-gate price of Urea	Baht/ton	8,375	7,944	9,290	8,839	8,820	8,359
14) Farm-gate price of nutrient	Baht/ton	18,200	17,320	20,195	19,215	19,175	18,170
		(N)	(N)	(N)	(N)	(N)	(N)

Note : 1/ Commodity prices and price projections in 1985 constant Dollars, July 11, 1989, IBRD.

2/ IBRD, Inflation indices, 1985 = 100, 1989 = 149.55

3/ Commission fee is about 0.25 % of CIF price

4/ Income tax and municipal tax. Source is ibid 3/

5/ Port fee, Expenses on receiving merchandise, freight on small boat, labor cost for carrying to small boat, labor cost for carrying to godown and survey expenses.

6/ Godown is average three month usage.

7/ Marketing Costs and Information Network for Asia and the Pacific, ESCAP / FAO / INIDO, 1985/86.

TABLE I-3-11 PRICE STRUCTURE FOR DAP (18-46-0)

Item	Unit	1989		1995		2000	
		Financial	Economic	Financial	Economic	Financial	Economic
1) FOB, in 1985 constant	US\$/ton	158	158	185	185	194	194
2) Converted to 1989 constant	US\$/ton	236	236	277	277	290	290
3) Freight (US\$70) & insurance	US\$/ton	76	76	76	76	76	76
4) CIF price at Bangkok port	US\$/ton	312	312	353	353	366	366
5) Convert to Thai Baht	Baht/ton	8,050	8,050	9,110	9,110	9,440	9,440
6) Commission fee	Baht/ton	20	18	20	18	20	18
7) Taxes Expenses	Baht/ton	140	-	155	-	160	-
8) Port Expenses	Baht/ton	400	370	455	420	465	427
9) Godown Expenses	Baht/ton	60	55	60	55	60	55
10) Import / factory price	Baht/ton	8,670	8,493	9,800	9,603	10,145	9,940
11) Marketing costs and margins	Baht/ton						
a. Transport costs		100	90	100	90	100	90
b. Storage costs		90	80	90	80	90	80
c. Handling costs		105	100	105	100	105	100
d. Taxes, levies, custom duties		105	-	105	-	105	-
e. Interest charges		20	-	20	-	20	-
f. Other costs		100	90	100	90	100	90
g. Importers margin		60	55	60	55	60	55
h. Wholesale margin		15	15	15	15	15	15
i. Retail margin		30	25	30	25	30	25
(Sub - total)		(625)	(455)	(625)	(455)	(625)	(455)
12) Transport cost from farm to shop	Baht/ton	30	25	30	25	30	25
13) Farm-gate price of Urea	Baht/ton	9,325	8,973	10,455	10,083	10,800	10,420
14) Farm-gate price of nutrient	Baht/ton	13,150	12,750	14,830	14,400	15,975	15,940
		(P)	(P)	(P)	(P)	(P)	(P)

TABLE I-3-12 PRICE STRUCTURE FOR POTASSIUM CHLORIDE (K 60)

Item	Unit	1989		1995		2000	
		Financial	Economic	Financial	Economic	Financial	Economic
1) FOB, in 1985 constant	US\$/ton	69	69	72	72	75	75
2) Converted to 1989 constant	US\$/ton	103	103	108	108	112	112
3) Freight (US\$70) & insurance	US\$/ton	72	72	72	72	72	72
4) CIF price at Bangkok port	US\$/ton	175	175	180	180	184	184
5) Convert to Thai Baht	Baht/ton	4,530	4,530	4,660	4,660	4,760	4,760
6) Commission fee	Baht/ton	20	18	20	18	20	18
7) Taxes Expenses	Baht/ton	80	-	80	-	80	-
8) Port Expenses	Baht/ton	225	207	235	217	240	220
9) Godown Expenses	Baht/ton	60	55	60	55	60	55
10) Import / factory price	Baht/ton	4,915	4,810	5,055	4,950	5,160	5,053
11) Marketing costs and margins	Baht/ton						
a. Transport costs		100	90	100	90	100	90
b. Storage costs		90	80	90	80	90	80
c. Handling costs		105	100	105	100	105	100
d. Taxes, levies, custom duties		105	-	105	-	105	-
e. Interest charges		20	-	20	-	20	-
f. Other costs		100	90	100	90	100	90
g. Importers margin		60	55	60	55	60	55
h. Wholesale margin		15	15	15	15	15	15
i. Retail margin		30	25	30	25	30	25
(Sub - total)		(625)	(455)	(625)	(455)	(625)	(455)
12) Transport cost from farm to shop	Baht/ton	30	25	30	25	30	25
13) Farm-gate price of Urea	Baht/ton	5,570	5,290	5,710	5,430	5,815	5,533
14) Farm-gate price of nutrient	Baht/ton	9,283	8,817	9,517	9,050	9,690	9,220
		(K)	(K)	(K)	(K)	(K)	(K)

I-3-2 Economic Costs of Farm Labor

1. The present situation on distribution of farm labor and wage rates

According to the Socio-agro economic survey conducted by RID, PPD, 1989, average annual cropping labor days per farm is constituted by 65.2% of family labor days and 34.8% of hired labor days. Crops are rice, sweet corn, Cassava, vegetables, tree crops (areca-palm and betel-nuts), coconuts and mango. The cropping labor days for rice culture occupy about 78% of total labor days. The following table shows average cropping labor days.

Average labor days per farm

Month	Family labor	Hired labor	Total labor	Hired labor	Note
Jan	4.79	6.46	6.46	2.3	1) Peak Period : Jul, Dec 57.9%
Feb	1.36	1.12	2.48	1.5	
Mar	2.17	1.67	3.84	2.3	2) Slack period : Jul, Aug, Nov 24.3%
Apr	3.46	2.49	5.95	3.4	
May	5.13	3.26	8.39	4.5	3) Minimum period : Jan, Feb, Mar, Apr, May, Sep, Oct 17.8%
Jun	15.07	5.34	20.41	7.3	
Jul	21.62	17.15	38.77	23.6	
Aug	14.17	5.53	19.70	7.6	
Sep	7.24	1.26	8.50	1.7	
Oct	4.98	1.33	6.31	1.8	
Nov	14.02	6.85	20.87	9.4	
Dec	41.96	24.91	66.87	34.3	
Total	135.97 (65.2%)	72.60 (34.8%)	208.57 (100.0%)	100.0	

Source : Socio - agro economic survey, PPD, RID, 1989

Labor peak periods are found in July and December. The farmer is transplanting season of rice and the latter is harvesting season.

Figures shown above are averaged on 122 farmers sampled from the Existing Tha Lat Area, Tha Lat Expansion Area and Bang Pakong Expansion Area. Hired labor wages are different by these sub-project area as shown in the following table.

Average Wage of Rice, Maize and Cassava by Operation

(Unit : Baht)

Operation	Transplanted rice		Dry Broad-Casted rice		Wet Broad Cast. rice	Maiz Cassava	
	Exist-Tha Lat	Tha Lat Expans.	Exist-Tha La	Tha Lat Expans.	Exist-Tha Lat	Exist-Tha La	Tha Lat Expans.
No of sample	(55)	(52)	(26)	(11)	(8)	(2)	(29)
Planting	72.5	59.7 to 69.8	n.a	n.a	n.a	50	45
Fertilizing	n.a	n.a n.a	70	"	"	n.a	n.a
Pest Control	"	50 "	n.a	"	"	"	"
Weeding	"	50 "	110	"	"	"	49
Watering	"	45 "	n.a	"	"	"	n.a
Harvesting	93.0	49.7 to 61.4	82	59.5	90.5	50	79
Threshing	55.7	42.9 to 49.6	61.6	50	100	n.a	n.a
Hauling		48.9 to 50	60.7	50	n.a	50	"

Average wage of Vegetable and Betel-nuts by operation

(Unit : Baht)

Operation	Chanese Kale	Kunchai	Betel nuts
Land Preparation	100	150	147
Fertilizing	60	n.a	60
Pest Control	n.a	"	35
Weeding	60	"	62
Soil Breaking	n.a	"	100
Ditch Improvement	"	"	99
Harvesting	65.5	72	83

Average wage by Crop

(Unit : Baht)

Rice		Tree Crops	
HYV	62.76	Areca - Palm	87.09
Improved	63.58	Betel - Nuts	86.44
Local	67.57		
Average	65.97		
Upland Crops		Fruits	
Sweet Corn	40.00	Coconuts - Fruit	90.43
Cassava	48.91	Coconuts - dry	99.05
		Mangoes	79.85
Vegetables			
Celery	352.68		
Chinese Kale	75.66		

Wage rates of labor hired for cropping culture in the project area are different by area, crop and operation. These differences are ranged as follows.

Wage rates of Agricultural hired labor

(Unit : Baht)

Crops	Maximum	Average	Minimum
Rice	93 - 100	66	43 - 45
Maize	50	40	n.a
Cassava	79	49	45
Vegetable	150	76	60
Betel - nuts	147	86	35
Coconuts	n.a	90 - 99	n.a
Mango	"	80	"

Expansion of number of new factories in recent years has been contributing to increase opportunities of employment for farmers in the Project area.

As regards the socio-agro economic survey, about 63% of 122 sample obtains the off-farm hired labore income. Percentage by type of work is shown as follows.

Type of Work	Percent of Type of Worker	Off-farm Worker to Total Farmer
	%	%
Farm worker (human labor)	32.3	23.8
Farm worker (with machinery)	3.2	2.3
Farm worker (with animal)	1.0	0.1
Livestock employee	3.2	2.3
Construction Worker	42.7	31.5
Transportation worker	2.0	1.5
Industry worker	5.2	3.8
Government employee	10.4	7.7
Total	100.0	63.0

Periods hired for the off-farm works are classified as follows.

Number of Sample by Periods Hired

Type of Work	Total Sample	Less one month	One to three month	Above four month
1. Farm Worker (human labor)	28	15	10	3
2. Farm worker (machinery)	3	1	2	-
3. Farm worker (animal)	1	1	-	-
4. Livestock employee	3	1	-	2
5. Construction Worker	40	3	23	14
6. Transportation worker	2	1	1	-
7. Industry worker	4	-	1	3
Total	81	22	37	22

When farmers hired for above four months are considered to take the permanent off-farm employment opportunities, the size of permanent opportunities are limited (17% of total sample).

Hence, the size of the permanent off-farm employment opportunities is not compete with the opportunities for farm work yet.

Average household size and farm labor status of sample 122 are calculated as follows.

Household size	4.98	(100.0)	persons
of which : male	2.44	(49.0)	
female	2.54	(51.0)	
Farm labor	2.97	(59.6)	
of which : full time	2.64	(53.0)	
part time	0.33	(6.6)	

On the other hand, annual average work days per farm are estimated at about 210 days of which family labor for cropping culture is 135 days and off-farm hired labor is 75 days. It is considered that, in comparison of size of farm labor with annual average work days, the workable capacity of family labor has room to do the more works for cropping culture.

Average wage rates of off-farm hired labor are shown as the following table.

Wage Rates of Off-farm Hired labor

Type of work	Maximum	Average	(Unit : Baht)
			Munimum
1) Farm worker			
Exist. Tha Lat Area	150 - 200	108	33 - 45
Tha Lat Expans Area	130 - 140	52	40
2) Construction worker	150 - 200	112	60 - 70
3) Industrial worker	140	100	65

2. Methods of estimation on economic cost of farm labor

Pricing of farm labor is the assessment of the opportunity cost. The marginal opportunity cost of labor supplied for farm operation in the Project area can be represented by an "S - shaped" curve. This curve is drawn using the following general criteria.

Point A : The opportunity for off-farm employment

During the "non - peak" period farmers can, and often do, undertake activities like fishing, carpentry, home repairs, wood gathering, cottage industries, construction works and casual labor.

Wage rates of these jobs are unclear. Hence, as the idealized procedure, the value of the incremental caloric intake demanded by changes in labor activity is estimated. But the value estimated by this method is too low. The meal cost for hired labor is considered as the reasonable value.

Using results of the socio-agro economic survey, the marginal opportunity labor cost of Point A is assumed at 8 baht.

Food & beverage value per farm	...	14,721 baht
Average size of farm population	4.98 person
Annual meal cost per person	2,954 baht
Meal cost per day per person	about 8.0 baht

Point B : The farm work season as usual (non-peak period)

The value of point B is a function of the size of the permanent off-farm employment opportunities and labor force participation rates.

Hence, the opportunities for farm work compete with the permanent off-farm employment opportunities. The less productive off-farm employment is scarce, the more farm labor force is drawn into farm work.

The value of point B is assumed at 33 baht which is minimum wage rate of off-farm hired labor.

Point C : The full employment peak periods

At the employment level corresponding to full employment peak periods, the opportunity cost is equal to the observed market wage rate.

Average wage rate of 66 baht paid in rice culture is considered as market wage rate and assumed as the value of point C.

Point D : the attractive farm wage rate for outside labor market

The value of point D is the opportunity cost of alternative labor outside the project area supplying the labor pool.

Labor would be hired under the more demand than the full employment for farmers themselves.

Hence wage rate go up. The opportunity cost of alternative labor pool correspond to the highest level of farm labor wage in the Project area. The value of point D is assumed at 100 baht of the maximum wage rate paid in rice culture.

The actual value of point A, B and C are assumed using wage rate level paid in rice culture. This is based on the main reason that acreage of paddy field occupy about 84% of total arable land in the Project area, hence, rice culture sector is in the most important status.

It is postulated that the marginal opportunity cost of labor supplied for farm work in the Project area can be represented by an " S - shaped " curve which is drawn in Figure and using Point A, B, C and D as mentioned above.

3. Available Farm Labor Force

Farm labor force to be available in the Project area will be depended upon labor inside and outside the Project area. Forecasting of labor availability outside the Project area is difficulty. Hence the study is limited inside the Project area.

At the present, the cropping labor is supplied by the family labor and hired labor is the landless labor and exchange-operation labor. Family labor is divided to full-time labor and part-time labor.

Landless labor will be increased through the implementation period of the Project. Part-time labor of family labor force will be converted to full-time labor by generation of beneficial area.

Table explain available farm labor force.

4. Total Labor Demand by Month

The labor demand by month which are shown in Table and Table was calculated based on the data of labor distribution by crops. These man days by months are converted to percentage of potential full employment as shown at Table and .

5. Wage Rate by Month

Wage rate, namely, marginal opportunity cost are assumed by application of percentage of potential full employment to " S - shaped " curve. (Table I-3-23 and Table I-3-24)

TABLE I-3-16 PROJECTION OF POPULATION AND FARM-HOUSEHOLD

Year	Population			Farm-household in Project Area
	10Districts	Project Area		
		Total	Farm-household	
1988	985,532	120,875	83,810	14,800
1989	697,600	123,000	85,300	15,000
1990	709,900	125,200	86,800	15,300
1991	722,400	127,400	88,300	15,600
1992	735,000	129,600	89,900	15,900
1993	748,000	131,900	91,400	16,100
1994	761,200	134,200	93,000	16,400
1995	774,600	136,600	94,700	16,700
1996	788,200	139,000	96,400	17,000
1997	802,100	141,400	98,000	17,300
1998	816,200	143,900	99,800	17,600
1999	830,500	146,400	101,500	17,900
2000	845,200	149,000	103,300	18,300

- Note : 1. Annual growth rate of population is assumed at 1.76% by 2,000. The rate is based on the population statistics.
 2. Average population per farm-household is assumed 5.66 persons by 2,000. Average population is based on Socio-economic survey, 1987, NSO.

TABLE I-3-17 TREND OF POPULATION BY DISTRICT

Province	District	1979	1988	1988/1979	Annual Rate (%)
Chachoengsao	Sanam Chaiket	39,795	71,606	1.80	6.75
	Panam Sarakam	70,348	72,907	1.04	0.44
	K.Patchasan	10,691	12,233	1.14	1.47
	Bang Khla	56,935	60,879	1.07	0.75
	Plean Yao	23,178	29,876	1.29	2.87
	Muang	117,923	132,447	1.12	1.27
	Ban Pho	41,896	45,022	1.07	0.75
	Ban Pakong	62,732	73,099	1.17	1.76
	Sub-total	(423,498)	(498,069)	(1.18)	1.86
Chonburi	Phanat Nikhon	122,257	143,908	1.18	1.86
	Plan Thong	37,779	43,555	1.15	1.56
	Sub-total	(160,036)	(187,463)	(1.17)	1.76
	Total	<u>583,534</u>	<u>685,532</u>	<u>1.17</u>	<u>1.76</u>

Source : Population statistics

TABLE I-3-18 AVAILABLE FARM LABOR FORCE IN THE PROJECT AREA WITHOUT THE PROJECT

Year	Population			Agricultural Labor			
	Total	Farm-household	Non-farm household	Family labor	Full-time labor	Part-time labor	Land-less labor
1988	120,875	83,810	37,065	49,950	44,420	5,530	2,900
2989	123,000	85,300	37,700	50,050	44,420	5,630	2,950
1990	125,200	86,800	38,400	50,150	44,420	5,730	3,000
1991	127,400	88,300	39,100	50,250	44,420	5,830	3,050
1992	129,600	89,900	39,700	50,350	44,420	5,930	3,100
1993	131,900	91,400	40,500	50,450	44,420	6,030	3,150
1994	134,200	93,000	41,200	50,560	44,420	6,140	3,210
1995	136,600	94,700	41,900	50,660	44,420	6,240	3,270
1996	139,000	96,400	42,600	50,770	44,420	6,350	3,320
1997	141,400	98,000	43,400	50,890	44,420	6,470	3,380
1998	143,900	99,800	44,100	51,000	44,420	6,580	3,440
1999	146,400	101,500	44,900	51,110	44,420	6,690	3,500
2000	149,000	103,300	45,700	51,230	44,420	6,810	3,560

Note: Family labor in 1988 is estimated at 60% of farm-household, population. Full-time labor is estimated at 89% of family labor. Landless labor is assumed at about 8% of non-farm household. Annual growth rate of part-time labor and land less labor are used in 1.76%.

TABLE I-3-19 MONDAYS PER MONTH OF AVAILABLES FARM LABOR FORCE WITHOUT THE PROJECT

Unit : person, 1,000 days

Year	Full-time labor		Part-time labor		Landless labor		Total
	Population	Md/Mth	Population	Md/Mth	Population	Md/Mth	
1988	44,420	1,110	5,530	28	2,900	73	1,211
1989	44,420	1,110	5,630	28	2,950	74	1,212
1990	44,420	1,110	5,730	29	3,000	75	1,214
1991	44,420	1,110	5,830	29	3,050	76	1,215
1992	44,420	1,110	5,930	30	3,100	78	1,218
1993	44,420	1,110	6,030	30	3,150	79	1,219
1994	44,420	1,110	6,140	31	3,210	80	1,221
1995	44,420	1,110	6,240	31	3,270	82	1,223
1996	44,420	1,110	6,350	32	3,320	83	1,225
1997	44,420	1,110	6,470	32	3,380	85	1,227
1998	44,420	1,110	6,580	33	3,440	86	1,229
1999	44,420	1,110	6,690	33	3,500	88	1,231
2000	44,420	1,110	6,810	34	3,560	89	1,233

Note : Average labor days per month is assumed as follows.

Full-time labor 25days, part-time labor 5days, land-less labor 25days

TABLE I-3-20 AVAILABLE FARM LABOR FORCE IN THE PROJECT AREA WITH THE PROJECT

Unit : person, 1,000 days

Year	Full-time labor		Part-time labor		Landless labor		Total Md/Mth
	Population	Md/Mth	Population	Md/Mth	Population	Md/Mth	
1988	44,420	1,110	5,530	28	2,900	73	1,211
1989	44,420	1,110	5,630	28	2,950	74	1,212
1990	44,420	1,110	5,730	29	3,000	75	1,214
1991	44,420	1,110	5,830	29	3,050	76	1,215
1992	44,420	1,110	5,930	30	3,130	78	1,218
1993	44,420	1,110	6,030	30	3,210	80	1,220
1994	44,420	1,110	6,140	31	3,290	82	1,223
1995	44,600	1,115	6,060	30	3,400	85	1,230
1996	44,800	1,120	5,970	30	3,520	88	1,238
1997	45,070	1,127	5,820	29	3,640	91	1,247
1998	45,080	1,127	5,920	29	3,770	94	1,250
1999	46,420	1,160	4,690	23	3,900	98	1,281
2000	46,420	1,160	4,810	23	4,040	101	1,284

Note : As the beneficial area would be generated from 1995 years, a part of part-time labor would be converted to full-time labor. Landless labor would be extended from 1992 years. Annual growth rate of the latter is assumed at 2.5 to 3.5%.

TABLE I-3-21 TOTAL LABOR DEMAND BY MONTH WITHOUT THE PROJECT

(Unit : 1,000 man-day)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1997-2001	49	19	40	60	65	225	421	226	67	58	173	604	2,006

Note : It is assumed that the labor demand for farming in the Project area is constant in the conditions of without the Project.

TABLE I-3-22 TOTAL LABOR DEMAND BY MONTH WITHOUT THE PROJECT

(Unit : 1,000 man-day)

Year	AL	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1994	1,223	62	37	36	128	53	3	46	93	84	61	78	58	738
1995	1,230	67	44	41	134	59	6	114	254	260	189	220	134	1,521
1996	1,238	105	127	102	196	127	42	214	352	357	253	272	191	2,337
1997	1,247	147	188	147	255	171	50	292	499	516	378	422	402	3,467
1998	1,250	192	255	199	321	250	68	392	690	717	524	601	443	4,651
1999	1,281	221	295	227	355	284	76	459	822	856	626	715	526	5,460
2000	1,284	221	295	227	355	284	76	459	822	856	626	715	526	5,460
2001	1,248	221	295	227	355	284	76	459	822	856	626	715	526	5,460

Note : AL : Available labor forces inside the Project area.

TABLE I-3-23 MONTHLY FARM LABOR DEMAND AS PERCENTAGE OF POTENTIAL EMPLOYMENT

- Without the Project -

(Unit : %)

Year	AL	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1994	1,221	4	2	3	5	5	18	34	18	5	5	14	49
1995	1,223	4	2	3	5	5	18	34	18	5	5	14	49
1996	1,225	4	2	3	5	5	18	34	18	5	5	14	49
1997	1,227	4	2	3	5	5	18	34	18	5	5	14	49
1998	1,229	4	2	3	5	5	18	34	18	5	5	14	49
1999	1,231	4	2	3	5	5	18	34	18	5	5	14	49
2000	1,233	4	2	3	5	5	18	34	18	5	5	14	49
2001	1,233	4	2	3	5	5	18	34	18	5	5	14	49

TABLE I-3-24 MONTHLY FARM LABOR DEMAND AS PERCENTAGE OF POTENTIAL EMPLOYMENT

- With the Project -

(Unit : %)

Year	AL	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1994	1,223	5	3	3	10	4	0.2	4	8	7	5	6	5
1995	1,230	5	4	3	11	5	0.5	9	20	21	15	18	11
1996	1,238	8	10	8	16	10	3	17	28	29	20	22	15
1997	1,247	12	15	12	20	14	4	23	40	41	30	34	32
1998	1,250	15	20	16	26	20	5	31	55	57	42	48	35
1999	1,281	17	23	18	28	22	6	36	64	67	49	56	41
2000	1,284	17	23	18	28	22	6	36	64	67	49	56	41
2001	1,284	17	23	18	28	22	6	36	64	67	49	56	41

TABLE I-3-25 WAGE RATE BY MONTH WITHOUT THE PROJECT

(Unit : Baht/man-day)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1997-2001	10	9	9	11	11	16	24	17	11	11	14	32

TABLE I-3-26 WAGE RATE BY MONTH WITH THE PROJECT

(Unit : Bath/man-day)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1994	10	9	9	13	10	8	10	12	11	10	11	10
1995	10	10	9	13	10	8	12	17	18	15	16	13
1996	12	13	12	16	13	9	16	21	21	17	18	15
1997	13	15	13	17	14	10	18	27	27	22	24	23
1998	15	17	15	20	17	10	23	35	36	28	32	25
1999	16	18	16	21	18	11	25	41	43	32	36	27
2000	16	18	16	21	18	11	25	41	43	32	36	27
2001	16	18	16	21	18	11	25	41	43	32	36	27

TABLE I-3-27 TOTAL LABOR COST BY MONTH WITHOUT THE PROJECT

(Unit : 1000 Baht)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1997-2001	490	171	360	660	715	3,600	10,104	3,842	737	638	2,422	19,328	43,067

TABLE I-3-28 TOTAL LABOR COST BY MONTH WITH THE PROJECT

(Unit : 1,000 Baht)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1994	620	333	324	1,664	530	24	460	1,116	924	610	858	580	8,043
1995	670	396	369	1,742	590	48	1,368	4,318	4,680	2,835	3,520	1,742	22,278
1996	1,260	1,524	1,224	3,136	1,651	378	3,424	7,392	7,497	4,301	4,896	2,865	46,940
1997	1,911	2,444	1,911	4,335	2,394	500	5,256	13,473	13,932	8,316	10,128	9,246	73,846
1998	3,072	4,335	2,985	6,420	4,250	680	9,016	24,150	25,812	14,672	19,232	11,075	125,699
1999	3,536	5,310	3,632	7,445	5,112	836	11,475	33,702	36,808	20,032	22,880	14,202	164,980
2000	3,536	5,310	3,632	7,445	5,112	836	11,475	33,702	36,808	20,032	22,880	14,202	164,980
2001	3,536	5,310	3,632	7,445	5,112	836	11,475	33,702	36,808	20,032	22,880	14,202	164,980

TABLE I-3-29 SHADOW WAGE RATE WITH THE PROJECT

Year	Total labor cost 1,000Baht	Total labor cost 1,000Man-days	Average wag rate Baht
1994	8,043	738	11
1995	22,278	1,521	15
1996	46,940	2,337	20
1997	73,846	3,467	21
1998	125,699	4,651	27
1999	164,980	5,460	30
2000	164,980	5,460	30
2001	164,980	5,460	30

Note : Shadow wage rate (%)
Shadow wage in full development stage....30baht
Present market rate66baht
Shadow wage rate = $30/66 = 45\%$

TABLE 1-3-30 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Paddy (Transplanting, Wet Season)
With the Project

Item	1989			2000		
	Quantity	Price	Value	Quantity	Price	Value
		Baht	Baht		Baht	Baht
1. GPV	3.210 t	3,280 /t	10,529 /t	4.000 t	3,260 /t	13,040
2. Cost						
- Seed	60k	3.3 /k	198	63 k	3.3/k	208
- Fertilizer			(2,794)			(4,120)
Urea	50 k	8.839 /k	440	63 k	8.359/k	657
P ₂ O ₅	P:60	14.4	864	100	15.94	1,594
16-20-0	210	5.955	1,250	280	6.095	1,667
Lime	1.0 t	240 /t	240	1.26 t	240/t	302
- Agro-chemical						
Pesticide	3 k	165k	495	3 k	165/k	495
- Machine	116 hr		566	116hr		566
- Oil			(1,048)			(1,048)
Gasoline	180.6ℓ	3.9 /ℓ	704	180.6ℓ	3.9/ℓ	704
Lubricant	18.1	19	344	18.1	19	344
- Labor	65	30/d	1,950	65	30/d	1,950
Total Cost			7,051			8,387
3. NPV			3,478			5,103
						4,653

TABLE I-3-31 CROP BUDGET PER HA IN ECONOMIC PRICE

CROP : Paddy (Transplanting, Wet Season)

(At Present)

Without the Project

Item	1989			1989			2000			Note
	Quantity	Price	Value	Quantity	Price	Value	Quantity	Price	Value	
		Baht	Baht		Baht	Baht		Baht	Baht	
1. GPV	2.103 t	3,895/t	8,191	2.232 t	3,280/t	7,320	2.346/t	3,260/t	7,648	1. Yield in 1989 is on figures weighted production of
2. Cost										
- Seed	50 k	3.9/k	195	50k	3.3k	165	50 k	3.3 k	165	three irrigation block.
- Fertilizer			(648)			(763)			(8170)	Yield in 1995 and 2000 are
Urea	4.8 k	7,994/k	38	50 k	8,839/k	44	5.3	8,359 k	45	estimated by use
16-20-0	114 k	5,313/k	606	120	5,955	715	126	6,095	768	of annual 1.3% growth rate
15-15-15	0.04 k	5,826/k	1	0.04 k	6.40	1	0.04	6,500	1	of about which is calculated
20-20-0	0.4 k	7,767/k	100	0.4 k	8,534	3	0.4 k	8,666	3	on trend of major rice yield
- Agro-chemical			100			100			100	during 1977/80 and
- Machine	43.4 hr		(2,682)	43.4 hr		(2,682)	43.4 hr		(2682)	1988/89, Thailand.
Land Pre + Nursery	62% 26.9	70	1,883	26.9	70	1,883	26.9	70	1,883	2. Quantity figures in 1989
Watering	25% 10.9	39	425	10.9	39	425	10.9	39	425	are based on the socio-agro
Threshing	5% 2.1	145	304	2.1	145	304	2.1	145	304	economic survey, 1989,
Hauling	28% 3.5	20	70	3.5	20	70	3.5	100	350	RID.
- Oil			(186)			(186)			(186)	3. Machinery costs are
Gasoline	38 ℓ	3.9/ℓ	148	38/ℓ	3.9/ℓ	148	38 ℓ	3.9/ℓ	148	weighted on rate by
Lubricant	2 ℓ	19	38	2/ℓ	19	38	2 ℓ	19	38	operation and rate by
- Labor	44.2 day	30 d	1,326	45.2	30/d	1,356	46.2	30/d	1,386	small or larger tractor.
Total Cost			4,942			5,252			6,336	
3. NPV			3,249			2,068			2,312	

TABLE I 3-33 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Paddy (Broadcasting, Dry Season)

(With the Project)

Item	1995			2000			Note
	Quantity	Price	Value	Quantity	Price	Value	
		Baht	Baht		Baht	Baht	
1. GPV	3.920	3,280/t	12,858	4.500	3,260/t	14,670	
2. Cost							
- Seed	94 k	3.3/k	310	94 k	3.3/k	310	
- Fertilizer			(3,489)			(4,252)	
Urea	55	8.839/k	487	63	8.359/k	527	
P ₂ O ₅	P: 80	14.4	1,152	100	15.94	1,594	
16-20-0	260	5.955	1,548	300	6.095	1,829	
Lime	1.26 t	240/t	302	1.26 t	240/t	302	
- Agro-chemical							
Pesticide	3 k	165/k	495	3 k	165/k	495	
Lime	112 hr	-	531	112 hr		531	
- Agro-chemical			(1,033)			(1,033)	
Pesticide	178.5 ℓ	3.9 /ℓ	693	178.5 ℓ	3.9 /ℓ	693	
- Machine	17.9	19	340	17.9	19	340	
- Labor	40 d	30 d	1,200	40 d	30 d	1,200	
Total Cost			7,058			7,821	
3. NPV			5,800			6,849	

TABLE I 3-33 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Paddy (Broadcasting, Dry Season)

(With the Project)

Item	1995			2000			Note
	Quantity	Price	Value	Quantity	Price	Value	
		Baht	Baht		Baht	Baht	
1. GPV	3.920	3,280/t	12,858	4.500	3,260/t	14,670	
2. Cost							
- Seed	94 k	3.3/k	310	94 k	3.3/k	310	
- Fertilizer			(3,489)			(4,252)	
Urea	55	8.839/k	487	63	8.359/k	527	
P ₂ O ₅	P:80	14.4	1,152	100	15.94	1,594	
16-20-0	260	5.955	1,548	300	6.095	1,829	
Lime	1.26 t	240/t	302	1.26 t	240/t	302	
- Agro-chemical							
Pesticide	3 k	165/k	495	3 k	165/k	495	
Lime	112 hr	-	531	112 hr		531	
- Agro-chemicall			(1,033)			(1,033)	
Pesticide	178.5 ℓ	3.9 /ℓ	693	178.5 ℓ	3.9 /ℓ	693	
- Machine	17.9	19	340	17.9	19	340	
- Labor	40 d	30 d	1,200	40 d	30 d	1,200	
Total Cost			7,058			7,821	
3. NPV			5,800			6,849	

TABLE I-3-34 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Paddy (Broadcasting, Wet Season and Dry Season)

(At Present)

(Without the Project)

Item	1989			1995			2000			Note
	Quantity	Price	Value	Quantity	Price	Value	Quantity	Price	Value	
		Baht	Baht		Baht	Baht		Baht	Baht	
1. GPV	1.998 t	3,895/t	7,782	2.140/t	3,280/t	7,019	2.303 t	3,260/t	7,508	1. According to the Socio-agro
2. Cost	(2.103x0.95)									economic survey, 1989, RID, paddy
- Seed	84	3.9/k	328	84	3.3/k	227	84	3.3/k	277	yields are different as follows.
- Fertilizer			(803)			(959)			(1,043)	
Urea	1.5	7,944/k	12	1.6	8,839/k	14	1.7	8,359/k	14	Yield (kg/rai)
16-20-0	140	5,313	743	160	5,955	953	160	6,095	975	- Tha Lat Irrigation Area. -
15-15-15	1.2	5,826	7	1.2	6,401	7	1.2	6,500	8	Transplanted 460 (100)
20-20-0	5.3	7,767	41	5.3	8,534	45	5.3	8,666	46	Dry broadcasted 397 (86)
- Agro-chemical			80			100			100	Wet broadcasted 440 (95)
- Machine	9.3 hr		(675)	9.3 hr		(675)	9.3 hr		(675)	
Land Preparat.	58% 5.4	70	378			378			378	2. Quantity figures in 1989 are based
Watering	11% 1.0	39	30			30			30	on the Socio-agro economic survey,
Threshing	17% 1.6	145	232			232			232	1989, RID
Hauling	14% 1.3	20	26			26			26	
- Oil			(34)			34			34	
Gasoline	7.1 l	3.9	28			28			28	
Labricant	0.3 l	19	6			6			6	
- Labor	24.1 day	30	723	26.1	30	783	26.1	30	783	
Total Cost			2,643			2,828			2,912	
3. NPV			5,139			4,191			4,596	

TABLE I-3-35 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Cassava
(At Present & Without Project)

Item	1989 to 1995			Note
	Quantity	Price	Value	
		Baht	Baht	
1. GPV	15,232	615 /t	9,368	
2. Cost				
- Seed	8,500 pcs	0.042	357	
- Fertilizer			-	
- Agro-chemical			112	
- Machine	8.5	baht/hr	(1,794)	
Hire (Small)	4.1	180	738	
Hire (Large)	4.4	240	1,056	
Own (Small)				
- Animal	1.3	90 day	117	
- Transport	1 t	156 /t	156	
Oil: Gasoline	13	3.9/ℓ	51	
Labricant	2	19	38	
- Labor	62.8 d	30/d	1,884	
Total Cost		(48%)	4,471	
3. NPV			4,897	

TABLE I-3-36 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Maize (Wet season)
(With the Project)

Item	1995			2000			Note
	Quantity	Price	Value	Quantity	Price	Value	
		Baht	Baht		Baht	Baht	
1. GPV	2.3	2,330/t	5,359	2.5	2,515/t	6,288	
2. Cost	19k	2.3/k	48	19	2.5/k	48	
- Seed							
- Fertilizer			(883)			(975)	
15-15-15	138 k	6.40/K	883	150	6.50/k	975	
- Agro-chemical							
Pesticide	2 k	165/k	330	2 k	165/k	330	
Herbicide							
- Machine	28 hr		180	28 hr		180	
- Oil			(382)			(382)	
Gasoline	66 ℓ	3.9/ℓ	257	66 ℓ	3.9/ℓ	257	
Lubricant	6.6	19	125	6.6	19	125	
- Labor	40 d	30/d	1,200	40	30/d	1,200	
Total Cost			3,023			3,115	
3. NPV			2,336			3,173	

TABLE I-3-37 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Maize (Dry season)

(With the Project)

Item	1995			2000			Note
	Quantity	Price	Value	Quantity	Price	Value	
		Baht	Baht		Baht	Baht	
1. GPV	2.3	2,330/t	5,359	2.5	2,515/t	6,288	
2. Cost	19 k	2.3 /k	48	19	2.5/k	48	
- Seed							
- Fertilizer							
15-15-15	175	6.40/k	1,120	190	6.500/k	1,235	
- Agro-chemical							
Pesticide	2 k	165 /k	330	2 k	165 /k	330	
- Machine	28 hr		180	28 hr		180	
- Oil			(382)			(382)	
Gasoline	6.6 ℓ	3.9/ℓ	257	6.6 ℓ	3.9/ℓ	257	
Lubricant	6.6	19	125	6.6	19	125	
- Labor	40	30/d	1,200	40	30/d	1,200	
Total Cost			3,260			3,375	
3. NPV			2,099			2,913	

TABLE I-3-38 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Soybean (Dry season)
(With the Project)

Item	1995			2000			Note
	Quantity	Price	Value	Quantity	Price	Value	
		Baht	Baht		Baht	Baht	
1. GPV	1.2	8,630/t	10,356	1.5	6,150/t	9,225	
2. Cost	44 k	4.8/k	211	44	4.8/k	211	
- Seed							
- Fertilizer			(1,439)			(1,637)	
12-24-12	140	6,848/k	959	156	7,111/k	1,109	
Lime	2.0	240/t	480	2.0	240/t	480	
- Agro-chemical							
Pesticide	2 k	165/k	330	2 k	165/k	330	
- Machine	92 hr		499	92 hr		499	
- Oil			(700)			(700)	
Gasoline	120.4	3.9/ℓ	470	120.4	3.9/ℓ	470	
Lubricant	12.1	19	230	12.1	19	230	
- Labor	40	30/d	1,200	40	30/d	1,200	
Total Cost			4,379			4,577	
3. NPV			5,977			4,648	

TABLE I-3-39 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Mungbean (Dry Season)
(With the Project)

Item	1995			2000			Note
	Quantity	Price	Value	Quantity	Price	Value	
		Baht	Baht		Baht	Baht	
1. GPV	0.9 t	7,810/t	7,029	1.1 t	8,705/t	9,576	
2. Cost	19	4.8/k	91	19	4.8/k	91	
- Seed							
- Fertilizer			(1,439)			(1,637)	
12-24-12	140	6,848/k	959	156	7,111/k	1,109	
Lime	2 t	240/t	480	2.2 t	240/t	528	
- Agro-chemical							
Pesticide	2 k	165/k	330	2 k	165/k	330	
- Machine	77 hr		416	77 hr		416	
- Oil			(636)			(636)	
Gasoline	109.4 ℓ	3.9/ℓ	427	109.4	3.9/ℓ	427	
Lubricant	11.0	19	209	11.0	19	209	
- Labor	40	30/d	1,200	40	30/d	1,200	
Total Cost			4,112			4,550	
3. NPV			2,917			5,266	

TABLE I-3-40 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Groundnuts (Dry Season)
 (With the Project)

Item	1995			2000			Note
	Quantity	Price	Value	Quantity	Price	Value	
		Baht	Baht		Baht	Baht	
1. GPV	1.2 t	9,230/t	11,076	1.5 t	8,140/t	12,210	
2. Cost	50	4.8/k	240	50	4.8/k	240	
- Seed							
- Fertilizer			(1,439)			(1,637)	
12-24-12	140	6,848/k	959	156	7,111/k	1,109	
Lime	2 t	240/t	480	2.2 t	240/t	528	
- Agro-chemical							
Pesticide	2 k	165/k	330	2 k	165/k	330	
- Machine	53 hr		280	53 hr		280	
- Oil			(475)			(475)	
Gasoline	81.7 ℓ	3.9/ℓ	319	81.7	3.9/ℓ	319	
Lubricant	8.2	19	156	8.2	19	156	
- Labor	70	30/d	2,100	70	30 d	2,100	
Total Cost			4,864			5,052	
3. NPV			6,212			7,148	

TABLE I-3-41 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Green bean
With the Project

Item	1989			2000		
	Quantity	Price	Value	Quantity	Price	Value
		Baht	Baht		Baht	Baht
1. GPV	10.9 t	3,680/t	40,112	15.6 t	3,680 /t	57,408
2. Cost						
- Seed	14 K	40/k	560	14	40/k	510
- Fertilizer			(21,552)			(21,871)
P ₂ O ₅	P:180 k	14.4/k	2,592	180/k	15.94 /k	2,869
15-15-15	380	6.401/k	2,432	380	6.5/k	2,474
Dung	10	1,600/t	16,000	10 t	1,600/t	16,000
Lime	2.2 t	240/t	528	2.2 t	240/t	528
- Agro-chemical						
Pesticide	5 ℓ	165/ℓ	825	5 ℓ	165/ℓ	825
Herbicide						
- Machine	77hr		416	77 hr		416
- Oil			(636)			(636)
Gasoline	109.4ℓ	3.9/ℓ	427	109.4ℓ	3.9/ℓ	427
Lubricant	11	19	209	11	19	209
- Labor	50	30d	1,500	50	30d	1,500
Total Cost			25,489			25,808
3. NPV			14,623			31,600

TABLE I-3-42 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Chinese Cabbage
With the Project

Item	1989			2000		
	Quantity	Price	Value	Quantity	Price	Value
		Baht	Baht		Baht	Baht
1. GPV	13.2 t	1,380/t	18,216	18.8 t	1,380/t	25,944
2. Cost						
- Seed	3.2 k	110/k	352	3.2 k	110 k	352
- Fertilizer			9,048			(15,471)
Urea		8,839/k			8,359/k	
P ₂ O ₅	P : 125 k	14.4/k	1,800	P : 180	15.94	2,869
15-15-15	300	6,401/k	1,920	380	6,401/k	2,474
Dung	3 t	1,600/t	4,800	6 t	1,600/t	9,600
Lime	2.2	240/t	528	2.2	240/t	528
- Agro-chemical						
Pesticide	5 ℓ	165/ℓ	825	5 ℓ	165/ℓ	825
Herbicide						
- Machine	61 hr		332	61 hr		332
- Oil			(507)			(507)
Gasoline	87.2 ℓ	3.9/ℓ	340	87.2	3.9 ℓ	340
Lubricant	8.8	19	167	8.8	19	167
- Labor	68.8	30/d	2,064	68.8	30 d	2,064
Total Cost			13,128			18,726
3. NPV			5,008			7,218

TABLE I-3-43 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Sweet Corn
With the Project

Item	1989			2000		
	Quantity	Price	Value	Quantity	Price	Value
		Baht	Baht		Baht	Baht
1. GPV	7.9 t	2,300/t	18,170	11.3 t	2,300	25,990
2. Cost						
- Seed	14 k	30/k	420	14 k	30 k	420
- Fertilizer			(10,139)			(16,290)
Urea	-	-	-	-	-	-
P ₂ O ₅	P : 180 k	14.4/k	2,592	180	15.94/k	2,869
20-20-20	260	8.534/k	2,219	380	8.666/k	3,295
Dung	3 t	1,600/t	4,800	6 t	1,600/t	1,600
Lime	2.2	240/t	528	2.2	240/t	528
- Agro-chemical						
Pesticide						
Herbicide	5 ℓ	165/ℓ	825	5 ℓ	165/ℓ	825
- Machine	28 hr		180	28 hr		180
- Oil			(382)			(382)
Gasoline	66 ℓ	3.9/ℓ	257	66 ℓ	3.9/ℓ	257
Lubricant	66 ℓ	19	125	6.6	19	125
- Labor	50	30/d	1,500	50	30/d	1,500
Total Cost			13,446			19,597
3. NPV			4,724			6,393

TABLE I-3-44 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Tomato
With the Project

Item	1989			2000		
	Quantity	Price	Value	Quantity	Price	Value
		Baht	Baht		Baht	Baht
1. GPV	12.6 t	1,840/t	23,184	18.0 t	1,840/t	66,120
2. Cost						
- Seed	0.3 k	1,500/k	450	0.3	1,500/k	450
- Fertilizer	-	-	(7,262)	-	-	(10,671)
Urea	-	-	-	-	-	-
P ₂ O ₅	130 k	14.4/k	1,870	180 k	15.94/k	2,869
15-15-15	260	6.401/k	1,664	380	6.401/k	2,474
Dung	23 t	1,600 t	3,200	3 t	1,600 t	4,800
Lime	2.2	240 t	528	2.2	240 t	528
- Agro-chemical						
Pesticide	5 ℓ	165/ℓ	825	5 ℓ	165/ℓ	825
Herbicide						
- Machine	257 hr		1,032	257 hr		1,032
- Oil			(1,200)			(1,200)
Gasoline	206.5	3.9/ℓ	805	206.5	3.9/ℓ	805
Lubricant	20.8	19	395	20.8	19	395
- Labor	200	30/d	6,000	200	30/d	6,000
Total Cost			16,769			20,178
3. NPV			6,415			12,942

TABLE I-3-45 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Chili
With the Project

Item	1989			2000		
	Quantity	Price	Value	Quantity	Price	Value
		Baht	Baht		Baht	Baht
1. GPV	10.5 t	4,140/t	43,470	15.0 t	4140/t	66,120
2. Cost						
- Seed	0.6 k	200/k	120	0.6 k	200/k	120
- Fertilizer			(21,552)			(21,871)
Urea	-	-	-	-	-	-
P ₂ O ₅	180 k	14.4	2,592	180	15.94	2,869
15-15-15	380	6,401/k	2,432	380	6,401/k	2,474
Dung	10 t	1,600/t	16,000	10 t	1600/t	16,000
Lime	2.2 t	240/t	528	2.2	240/t	528
- Agro-chemical						
Pesticide	5 ℓ	165/ℓ	825	5 ℓ	165/ℓ	825
- Machine	62 hr		335	62 hr		335
- Oil			(510)			(510)
Gasoline	87.9 ℓ	3.9/ℓ	343	87.9	3.9/ℓ	343
Lubricant	8.8	19	167	8.8	19	167
- Labor	100	30/d	3,000	100	30/d	3,000
Total Cost			26,342		(43%)	26,661
3. NPV			17,128			35,489

TABLE I-3-46 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Baby Corn
With the Project

Item	1989			2000		
	Quantity	Price Baht	Value	Quantity	Price Baht	Value
1. GPV	4.4 t	19/k	83,600	6.3 t	19/k	119,700
2. Cost						
- Seed	14 k	30/k	420	14 k	30/k	420
- Fertilizer			(22,363)			(22,690)
- Urea	-	-	-	-	-	-
- P ₂ O ₅	P : 180 k	14.4/k	2,592	180	15.94/k	2,869
- 20-20-20	380	8,534/k	3,243	380	8,666/k	3,293
- Dung	10 t	1,600/t	16,000	10 t	1,600/t	16,000
- Lime	2.2 t	240/t	528	2.2	240/t	528
- Agro-chemical						
- Pesticide	5 ℓ	165/ℓ	825	5 ℓ	165/ℓ	825
- Machine	57 hr		315	57 hr		315
- Oil			(490)			(490)
- Gasoline	84.1 ℓ	3.9/ℓ	328	84.1 ℓ	3.9/ℓ	328
- Lubricant	8.5	19	162	8.5	19	162
- Labor	42	30/d	1,260	42	30/d	1,260
Total Cost			25,673			26,000
3. NPV			57,927			93,700

TABLE I-3-47 CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Mango (New Plant)

Item	1st Year			2nd Year			3rd Year			4th Year			5th Year		
	Quantity	Price	Value	Quantity	Price	Value	Quantity	Price	Value	Quantity	Price	Value	Quantity	Price	Value
1. GPV	-	-	-	-	-	-	-	-	-	-	-	-	1.56t	6,330/t	9,875
2. Cost															
- Seed			3,900												
- Fertilizer			2,600			3,300			3,500			3,950			3,950
Urea															
DAP															
Dung															
16-20-0															
12-24-12															
15-15-15															
Dung															
Lime															
- Agro-chemical			2,000			2,600			2,600			3,200			3,200
Pesticide															
Herbicide															
- Machine															320
- Oil			200			200			200			200			350
Gasoline															
Lubricant															
- Labor			1,200			1,200			1,200			1,200			1,800
Hire															
Family															
Total Cost			9,900			7,300			7,500			8,550			9,620
3. NPV			(-) 9,900			(-) 7,300			(-) 7,500			(-) 8,550			255

TABLE I-3-47 (Continue) CROP BUDGET PER HA IN ECONOMIC PRICE
CROP : Mango

Item	5th Year			7th Year			8th Year			9th Year		
	Quantity	Price	Value	Quantity	Price	Value	Quantity	Price	Value	Quantity	Price	Value
1. GPV	2,340t	6,330/t	14,812	4,690 t	6,330/t	29,688	9,380 t	6,330/t	59,375	15,63 t	6,330/t	98,930
2. Cost												
- Seed												
- Fertilizer			4,900			5,000			8,200			(13,077)
Urea										139K	359/k	1,162
15-15-15										110k	6,500/k	715
Dung										7t	1,600/t	11,200
- Agro-chemical			4,650			4,800			6,000			6,000
Pesticide												
- Machine			320			400			480	123.6hr		480
- Oil			350			440			540			(540)
Gasoline										93.1ℓ	3.91/ℓ	363
Lubricant										9.3	19	177
- Labor			2,100			2,560			2,780	98d	30/d	2,790
Total Cost			12,320			18,200			18,000			22,887
3. NPV			2,492			16,488			41,375			76,043

TABLE I-3-48 CROP BUDGET PER HA IN ECONOMIC PRICE
Mango (Existing Bang Pakong)

Item	1995		1996		1997		1998					
	Quantity	Price Baht	Value Baht	Quantity	Price Baht	Value Baht	Quantity	Price Baht	Value Baht			
1. GPV	5.210t	6,330/t	32,979	7.300 t	6,330/t	46,209	9,380 t	6,330/t	59,375	15.630 t	6,330/t	98,930
2. Cost												
- Fertilizer			6,500			7,500				8,200		13,140
- Chemical			4,800			5,500				6,000		6,000
- Machine			420			460				480		480
- Oil			460			500				540		540
- Labor			2,600			2,700				2,780		2,790
Total Cost			14,780			16,660				18,000		22,850
3. NPV			18,197			29,549				41,375		75,980

TABLE I-3-49 CROP BUDGET PER HA IN ECONOMIC PRICE
Mango (Bang Pakong Expansion)

Item	1995			1996			1997			1998		
	Quantity	Price	Value	Quantity	Price	Value	Quantity	Price	Value	Quantity	Price	Value
	t	Baht	Baht	t	Baht	Baht	t	Baht	Baht	t	Baht	Baht
1. GPV	3,020	6,330/t	19,117	4,690	6,330/t	29,688	9,380	6,330/t	59,375	15,630	6,330/t	98,930
2. Cost												
- Fertilizer			5,000			5,000			8,200			13,077
- Chemical			4,700			4,800			6,000			6,000
- Machine			370			400			480			480
- Oil			400			440			540			540
- Labor			2,200			2,560			2,780			2,790
Total Cost			12,670			13,200			18,000			22,887
3. NPV			6,447			16,488			41,735			76,043

Table I.3.50

Trend of Major Rice Yield

unit: kgs/rai

	<u>Thailand</u>	<u>Chachoengsao</u>	<u>Note</u>
1979/80	281		
1980/81	284		
1981/82	295		
1982/83	284		
1983/84	305		
1984/85	310	390	
1985/86	312	379	
1986/87	313	418	
1987/88	297	381	
1988/89	316	427	

Average growth rate
in Thailand
..... 316/281 = 1.3 %

Source: Agricultural Statistics of Thailand
Crop Year 1987/89, 1988/89
MOAC

Table I.3.51

Actual Labor Days of Rice Growers with High Yield

<u>Paddy</u>	<u>Sample No.</u>	<u>Yield</u>	<u>Crop Area</u>	<u>Labor Days per Year</u>	<u>Days per rai</u>	<u>Days per ha</u>
Transplanted		kg/rai	rai	day	day	day
	1.	625	24	180	7.5	47
	2.	667	12	100	8.3	52
	3.	714	17	101	5.9	37
	4.	500	21	157	7.5	47
	5.	522	25	221	8.8	55
	6.	640	25	193	7.7	48
	7.	524	42	345	8.2	51
	8.	591	22	81	3.7	23
	9.	559	17	82	4.8	30
	10.	533	15	90	6.0	38
	11.	526	19	151	7.9	49
	12.	556	27	138	5.1	32
	13.	529	44	238	5.4	34
	14.	528	55	250	4.5	28
	15.	590	29	175	6.0	38
	16.	850	20	145	7.3	46
	17.	500	83	583	7.0	44
	18.	522	23	195	8.5	53
	19.	600	10	76	7.6	48
	20.	525	20	210	10.5	66
	21.	533	10	79	7.9	49
	22.	545	22	274	12.5	78
	23.	533	30	161	5.4	34
	24.	550	20	169	8.5	53
	25.	524	38,5	286	7.4	46
	26.	535	26	168	6.5	41
	Average	559 (3.49t)	26.7	279.5	6.7	41.9
Broadcasted	1.	733	15	71	4.7	29
	2.	550	20	129	6.5	40
	3.	522	23	101	4.4	28
	4.	520	30	105	3.5	22
	5.	500	8	43	5.4	34
	6.	500	6	21	3.5	22
	7.	575	63.5	141	2.2	14
	Average	557 (3.48t)	27.6	611	3.7	23.1

Source: Socio-agro Economic Survey, 1989, RID.

I.3.4 Study on Operating Cost of Machinery

1. Financial operating cost items of machinery

The operating cost items for agricultural machinery are categorized as follows:

A. Fixed cost

- depreciation cost
- repair cost
- interest
- tax
- insurance
- car shed cost

B. Variable cost

- wage of operator
- fuel cost
- electric charge

2. Economic operating cost items of machinery

- i. Depreciation cost is not treated as a cost in the discounted cash flow analysis. Instead, the cost of an asset is shown in the year it is incurred, and the benefits are shown in the year they are realized. Since this is done over the life of the project, no depreciation allowance is needed to show the proportion of the value of the asset used in any given year. (J. PRICE GITTINGER, Economic Analysis of Agricultural Projects.)
- ii. Interest and tax are transfer payment cost. Hence, these are not treated as economic operating cost.
- iii. Economic operating costs consist of repair, insurance, car shed and variable cost (wage and fuel).

3. Financial operating cost without the Project

Financial operating costs of machinery without the Project are estimated by use of the results of Socio-agro economic survey, RID, 1989.

Unit costs of tractor rented without the project are averaged as follows:

- Paddy -

<u>Operation</u>	Baht/hour	
	<u>Hired small tractor</u>	<u>Hired large tractor</u>
Land preparation	50	240
Watering	42	n.a.
Threshing	140	214
Hauling	108	130
Nursery	22	n.a.

- Maize -

<u>Operation</u>	Baht/hour	
	<u>Hired small tractor</u>	<u>Hired large tractor</u>
Land preparation	156	n.a.
Threshing	68	45
Hauling	n.a.	n.a.
Transport	90	250

- Cassava -

<u>Operation</u>	Baht/hour	
	<u>Hired small tractore</u>	<u>Hired Large tractor</u>
Land preparation	159	n.a.
Harvesting	377	n.a.
Transport	312	n.a.

4. Estimation method for economic operating cost per hour

Economic operating cost's items are repair, car shed, and insurance.

Economic fixed cost per hour of three items mentioned above are estimated as follows:

- A. Consumer price by machine
- B. Ratio of repair cost to A.
- C. Ratio of car shed cost to A.
- D. Ratio of insurance cost to A.
- E. Fixed cost during the life --- $A \times (B+C+D)$
- F. Operating hour during the life by machine
- G. Financial fixed cost per hour --- E/F
- H. Economic fixed cost per hour --- $G \times 0.84$
(0.84: Conversion factor of capital goods)

5. Operating cost of machinery with the Project

Financial and economic fixed cost per ha are shown in the following tables.

Table I.3.52

Economic Cost of Machinery per Hour

- Repair cost + Car shed cost + Insurance cost -

Machinery	Consumer Price in Japan 1)	FOB Assumed Japan 2)	FOB Assumed Japan 3)	CIF Assumed Thailand 4)	Consumer Price Assumed 6)	Ratio of Repair Cost 7)	Ratio of Car Shed Cost 7)	Ratio of Insurance Cost 7)	Ratio Totalized
	Yen'000	Yen'000	US \$	Baht'000	Baht'000	%	%	%	%
Tractor	2,666	2,260	15,000	387.0	465.0	7	1.5	0.25	8.75
Plow	238	200	1,330	34.3	41.2	4	5.5	0.25	9.75
Harrow	200	170	1,130	29.2	35.0	4	5.5	0.25	9.75
Ridger	239	203	1,350	34.8	41.8	1	1	0.25	2.25
Sprayer	237	200	1,330	34.3	41.2	4	2	0.25	6.25
Thresher	174	148	980	25.3	30.4	4	2	0.25	6.25
Winnower	190	162	1,080	27.9	33.5	2	1	0.25	3.25
Regulator	230	195	1,300	33.5	40.2	2	1	0.25	3.25
Spreader	156	130	870	22.4	26.9	2	3.5	0.25	5.75
Tractor	115	100	670	17.3	20.8	2	3	0.25	5.25
Drill seeder	398	340	2,320	60.0	72.0	4	3	0.25	6.25

1): Consumer price in Japan

2): -1) x 0.85. (assumption-rate)

3): US \$ = 155 Yen

4): 3) x 1.03 (Ocean freight charge assumed)

5): US \$ = 25.8 Baht

6): 5) x 1.2 (Project area's consumer price assumed)

7): Ratios are mainly based on the regulation in Ministry of Agriculture, Japan

8): Figures are mainly based on the data in MOA, Japan

9): Conversion factor for capital goods in 0.84.

Cost During The Life	Life Year (7)	Operating		Financial		Economic	
		Hour	Hour	Fixed Cost of three Items per Hour	Fixed Cost of three Items per Hour (9)	Hour	Hour
40,700	8	5,000	5,000	8.1	8.1	6.8	6.8
4,020	5	500	500	8.0	8.0	6.7	6.7
3,410	5	350	350	9.7	9.7	8.1	8.1
940	5	350	350	2.7	2.7	2.3	2.3
2,580	5	500	500	5.2	5.2	4.4	4.4
1,900	5	500	500	3.8	3.8	3.2	3.2
1,090	5	500	500	2.2	2.2	1.8	1.8
1,310	3	500	500	2.6	2.6	2.2	2.2
1,550	5	500	500	3.1	3.1	2.6	2.6
1,090	4	1,000	1,000	1.1	1.1	0.9	0.9
4,500	5	200	200	22.5	22.5	18.9	18.9

Table I.3.53

Financial Fixed Cost of Machinery per Hour

Machinery	Consumer Price Assumed	Ratio of Fixed Cost	Cost During The Life	Operating Hour During Life	Financial Operating Cost per Hour
	Bahr'000	%	Baht	Hour	Baht
Tractor	465	12.05	56,000	5,000	11
Plow	41.2	13.65	5,660	500	11
Harrow	35.0	13.05	4,500	350	12
Ridger	41.8	5.55	2,300	350	7
Sprayer	41.2	9.55	3,900	500	7
Thresher	30.4	9.55	2,900	500	6
Winnower	33.5	6.55	3,200	500	6
Regulator	40.2	6.55	2,600	500	5
Spreader	26.9	9.05	2,400	500	5
Trailor	20.8	8.87	1,800	1,000	2
Drill seeder	72.0	9.55	6,800	200	34

Note: Ratio of fixed cost are mainly based on the regulation in Ministry of Agriculture, Japan.

Table I.3.54 NPV for Agriculture with Project

Phase I unit: million Baht

Year	Paddy Soybean Groundnuts Mngbean	Vegetable	Mango	Sub- total	Lost Value	Total
1994	11.2	6.8	-	18.0	-	18.0
1995	51.7	9.7	-	61.4	-0.7	60.7
1996	81.0	87.9	93.5	262.4	-0.7	261.7
1997	81.3	101.0	116.6	298.9	-0.7	298.2
1998	80.4	114.1	307.9	502.4	-0.7	501.7
1999	77.0	127.2	308.8	513.0	-0.7	512.3
2000	73.9	139.2	309.1	522.2	-0.7	521.5
2001	73.9	150.9	310.4	535.2	-0.7	534.5
2002	73.9	150.9	313.3	538.1	-0.7	537.4
2003	73.9	150.9	316.7	541.5	-0.7	540.8
2004	73.9	150.9	316.2	541.0	-0.7	540.3
2005	73.9	150.9	316.2	541.0	-0.7	540.3
2006	73.9	150.9	316.2	541.0	-0.7	540.3
2007	73.9	150.9	316.2	541.0	-0.7	540.3
2008	73.9	150.9	316.2	541.0	-0.7	540.3
2009	73.9	150.9	316.2	541.0	-0.7	540.3

Table I.3.55 NPV for Agriculture with Project

Phase II unit: million Baht

<u>Year</u>	<u>Paddy Soybean Groundnut Mungbean</u>	<u>Vegetable</u>	<u>Mango</u>	<u>Sub- total</u>	<u>Resettle- ment NPV</u>	<u>Lost Value</u>	<u>Total</u>
1994	-	-	-	-	-	-	-
1995	6.1	3.6	-	9.7	-	-	9.7
1996	39.1	19.1	-	58.2	-	-	58.2
1997	89.7	46.5	-	136.2	-	-18.9	117.3
1998	149.1	84.3	-7.4	226.0	21.2	-18.9	228.3
1999	194.6	124.3	-12.9	306.0	21.6	-18.9	308.7
2000	191.9	136.3	-18.5	309.7	22.0	-18.9	312.8
2001	190.7	137.6	-24.9	303.4	22.5	-18.9	307.0
2002	189.6	138.9	-17.3	311.2	22.9	-18.9	315.2
2003	188.4	139.9	-10.0	318.3	23.3	-18.9	322.7
2004	188.4	139.9	8.0	336.3	23.3	-18.9	340.7
2005	188.4	139.9	45.5	373.8	23.3	-18.9	378.2
2006	188.4	139.9	102.3	430.6	23.3	-18.9	435.6
2007	188.4	139.9	160.5	488.8	23.3	-18.9	493.2
2008	188.4	139.9	202.2	530.7	23.3	-18.9	534.9
2009	188.4	139.9	228.2	556.9	23.3	-18.9	560.9

Table I.3.56 NPV for Agriculture with the Project

Phase I + Phase II unit: million Baht

Year	Phase I	Phase II	Sub- total	Resettle- ment NPV	Lost Value		Total
					Si. Yat Dam	Diversion Dam	
1994	18.0	-	18.0	-	-	-	18.0
1995	61.4	9.7	71.1	-	-	-0.7	70.4
1996	262.4	58.2	320.6	-	-	-0.7	319.9
1997	298.9	136.2	435.1	-	-18.9	-0.7	415.4
1998	502.4	226.0	728.4	21.2	-18.9	-0.7	730.0
1999	513.0	306.0	819.0	21.6	-18.9	-0.7	821.0
2000	522.2	309.7	831.9	22.0	-18.9	-0.7	834.3
2001	535.2	303.4	838.6	22.5	-18.9	-0.7	841.5
2002	538.1	311.2	849.3	22.9	-18.9	-0.7	852.6
2003	541.5	318.3	859.8	23.3	-18.9	-0.7	863.5
2004	541.0	336.3	877.3	23.3	-18.9	-0.7	881.0
2005	541.0	373.8	914.8	23.3	-18.9	-0.7	918.5
2006	541.0	430.6	971.6	23.3	-18.9	-0.7	975.3
2007	541.0	488.8	1,029.8	23.3	-18.9	-0.7	1,033.5
2008	541.0	530.7	1,071.7	23.3	-18.9	-0.7	1,075.4
2009	541.0	556.9	1,097.9	23.3	-18.9	-0.7	1,101.6

Table I.3.57 NPV for Agriculture without the Project

Phase I + Phase II

unit: million Baht

<u>Year</u>	<u>Phase I</u>	<u>Phase II</u>	<u>Total</u>
1994	11.1	-	11.1
1995	12.2	12.9	25.1
1996	86.3	27.4	113.7
1997	86.6	59.8	146.4
1998	102.1	76.2	178.3
1999	103.5	76.4	179.9
2000	103.5	76.4	179.9
2001	103.5	76.4	179.9
2002	103.5	76.4	179.9
2003	103.5	76.4	179.9
2004	103.5	76.4	179.9
2005	103.5	76.4	179.9
2006	103.5	76.4	179.9
2007	103.5	76.4	179.9
2008	103.5	76.4	179.9
2009	103.5	76.4	179.9

Table I.3.58

Structure of Financial and Economic Cost

unit: %

Cost Component	Financial Cost				Economic Cost				Weighted Conversion Factor 6)
	Local Cost		Foreign Cost 2)		Local Cost		Foreign Cost		
	Transfer payment 1)	Un-skilled Labor 1)	Others	Transfer payment 3)	Un-skilled Labor 4)	Others	Others		
1. Si Yat Dam	9	5	33	53	-	2.25	29.7	53	0.850
2. Diversion Dam	9	5	14	72	-	2.25	12.6	72	0.868
3. Diversion Weir	9	5	62	24	-	2.25	55.8	24	0.821
4. Pumping Station	9	5	14	72	-	2.3	11.8	72	0.861
5. Irrigation System Phase I	9	10	36	45	-	4.5	32.4	45	0.819
Phase II	9	10	32	49	-	4.5	28.8	49	0.823
6. Drainage System	9	10	29	52	-	4.5	26.1	52	0.826
7. Land Acquisition	-	-	100	-	-	-	92	-	0.920
8. Resettlement & Compen.	-	-	100	-	-	-	92	-	0.920
9. O & M Equipment	-	-	20	80	-	-	16.8	80	0.968
10. Administration	-	-	100	-	-	-	92	-	0.920
11. Engineering Service	10	-	20	70	-	-	18.4	70	0.884
12. On farm develop.	10	20	7	63	-	9	6.3	63	0.783

Note: 1): Figures are estimated on the base of figures in the Sakae Krang River Basin Irrigation Project, 1986, JICA.

2): Foreign cost ratio is based on the disbursement schedule of Project costs.

3): The conversion factor for the transfer payment is 0.

4): The conversion factor for the un-skilled labor is 0.45.

5): The conversion factor for the others is as follows.

Dam, diversion dam, weir, irrigation, drainage and on farm --- 0.9

Pumping station and O & M equipment ----- 0.84 for capital goods.

Land acquisition, resettlement & compensation, administration and engineering services --- 0.92 for SCF.

6): Figures indicates the specific economic conversion factor for each cost component.

TABLE I-3-59 PROJECT ECONOMIC COST FOR PHASE I (Agriculture Sector)

Unit : million Baht

Works	Financial Cost	Weighted Conversion Factor	1991	1992	1993	1994	1995	1996	1997
	(F/C + L/C)	(M.B.)	%	%	%	%	%	%	%
A. Direct Project Cost									
1. Preparatory Work	20	0.900	-	(100) 18	-	-	-	-	-
2. Construction Cost	allocated								
2.1 Diversion Dam	1,670 × 0.63 = 1,052	0.868 (913)	-	(11.4) 104	(46.2) 422	(31.1) 284	(11.3) 103	-	-
2.2 Pumping Station	143	0.861 (123)	-	-	-	(57.5) 71	(42.5) 52	-	-
2.3 Irrigation System	261	0.819 (214)	-	-	(17.5) 37	(22.5) 48	(34.2) 73	(25.8) 56	-
2.4 Drainage System	86	0.826 (71)	-	-	(0)	(5) 3	(50) 36	(45) 32	-
Sub - Total (2)	2,160		-	104	459	406	264	88	-
3. Land Acquisition, Resettle., Compensat.	73.4	0.920 (68)	(26.7) 18	(26.7) 18	(25.3) 17	(21.3) 15	-	-	-
4. O & M Equipment	11	0.968 (11)	(60) 13	(40) 9	-	-	-	(100) 11	-
5. Survey & Investigat.	23.8	0.920 (22)	(10) 10	(17) 16	(21) 20	(20) 20	(18) 18	(14) 14	-
6. Administration	106	0.920 (98)	(30) 57	(20) 38	(15) 29	(15) 28	(10) 19	(10) 19	-
7. Engineering Services	216	0.884 (190)	98	203	525	469	301	132	-
Total (1-7)	2,911.8		98	203	525	469	301	132	-
8. Physical Contingency	291.2		9.8	20.3	52.5	46.9	30.1	13.2	-
9. Total (1-8)	3,203.0		107.8	223.3	577.5	515.9	321.1	145.2	-
B. Indirect Project Cost									
1. On-farm facilities	220	0.783 (172)	-	(17) 29	(17) 29	(17) 29	(17) 29	(32) 56	-
2. Engineering	26	0.884 (23)	(15) 3	(16) 3	(15) 3	(15) 4	(15) 4	(25) 6	-
Total (1-2)	246		3	32	32	33	33	62	-
3. Physical Contingency	25		0.3	3.2	3.2	3.3	3.3	6.2	-
Total (1-3)	271		3.3	35.2	35.2	36.3	36.3	38.2	-
C. Project Economic Cost for Phase I (Agriculture Sector)									
			11.1	258.5	612.7	552.2	357.4	213.4	-

TABLE I-3-60 PROJECT ECONOMIC COST FOR PHASE II (Agriculture Sector)

Unit : million Baht

Works	Financial Cost	Weighted Conversion Factor	1991	1992	1993	1994	1995	1996	1997	1997
	(F/C + L/C)	(M.B.)	%	%	%	%	%	%	%	%
A. Direct Project Cost										
1. Preparatory Work	26	0.900 (23.4)	-	-	(100) 23.4	-	-	-	-	-
2. Construction Cost	allocated									
2.1 Diversion Dam	1,060 × 0.63 = 668	0.850 (568)	-	-	(5.7) 32	(123) 70	(27) 153	(40) 228	(15) 85	(3.3) 14
2.2 Tha Lat Irrigation	518	0.821 (425)	-	-	(8.7) 36	(19.0) 81	(25.8) 110	(25.8) 110	(17.4) 74	(10) 30
2.3 Si Yat Irrigation	365	0.823 (300)	-	-	-	(17.0) 51	(24) 72	(25) 75	(24) 72	(10) 30
Sub - Total (2)	1,943		-	-	68	202	335	413	231	44
3. Land Acquisition	454	0.920 (418)	-	(50) 209	(27.9) 117	(7.3) 30	(7.4) 31	(7.4) 31	-	-
4. O & M Equipment	11.3	0.968 (11)	-	-	-	-	-	-	(100) 11	-
5. Survey & Investigat.	14.6	0.920 (13)	-	(60) 8	(40) 5	-	-	-	(14) 17	(9) 11
6. Administration	130.0	0.920 (120)	-	(13) 16	(15) 18	(17) 20	(17) 20	(15) 18	(10) 17	(2.8) 5
7. Engineering Services	194	0.884 (171)	-	(30) 51	(20) 35	(10) 17	(13.6) 23	(13.6) 23	(10) 17	(2.8) 5
Total (1-7)	2,995.9		-	284	266.4	269	409	485	276	60
8. Physical Contingency	299.6		-	28.4	26.6	26.9	40.9	48.5	27.5	6.0
Total (1-8)	3,298.5		-	312.4	293.0	295.9	449.9	533.5	303.6	66.0
B. Indirect Project Cost										
1. On-farm facilities	452	0.783 (354)	-	-	(10) 35	(20) 71	(20) 71	(20) 71	(20) 71	(10) 35
2. Engineering	54	0.884 (48)	-	(15) 7	(15) 7	(15) 7	(15) 7	(15) 7	(15) 7	(10) 6
Total (1-2)	506		-	7	42	78	78	78	78	41
3. Physical Contingency	50		-	0.7	4.2	7.8	7.8	7.8	7.8	4.1
4. Indirect Cost Total	556		-	7.7	46.2	85.8	85.8	85.8	85.8	45.1
C. Project Economic Cost for Phase II										
(Phase I + Phase II) (Agricultural Sector)			(111.1)	320.1	339.2	381.7	535.7	619.3	389.4	111.1
			(111.1)	(578.6)	(951.9)	(933.9)	(893.1)	(832.7)	(389.4)	(111.1)

TABLE I-3-60-1 PROJECT ECONOMIC COST FOR PHASE I (All Sector) 1/2

Unit : million Baht

Works	Financial Cost	Weighted Conversion Factor	1991	1992	1993	1994	1995	1996	1997
	(F/C + L/C)	(M.B.)	%	%	%	%	%	%	%
A. Direct Project Cost									
1. Preparatory Work	20	0.900	-	(100) 18	-	-	-	-	-
2. Construction Cost	allocated								
2.1 Diversion Dam	1,670	0.868 (1450)	-	(11.4) 165	(46.2) 670	(31.1) 451	(11.3) 164	-	-
2.2 Pumping Station	143	0.861 (123)	-	-	-	(57.5) 71	(42.5) 52	-	-
2.3 Irrigation System	261	0.819 (214)	-	-	(17.5) 37	(22.5) 48	(34.2) 73	(25.8) 56	-
2.4 Drainage System	86	0.826 (71)	-	-	(0)	(5) 3	(50) 36	(45) 32	-
Sub - Total (2)	2,160		-	165	707	573	325	88	-
3. Land Acquisition	73.4	0.920 (68)	(26.7) 18	(26.7) 18	(25.3) 17	(21.3) 15	-	-	-
4. O & M Equipment	11	0.968 (11)	-	-	-	-	-	(100) 11	-
5. Survey & Investigat.	23.8	0.920 (22)	(60) 13	(40) 9	-	-	-	-	-
6. Administration	106	0.920 (98)	(10) 10	(17) 16	(21) 20	(20) 20	(18) 18	(14) 14	-
7. Engineering Services	216	0.884 (190)	(30) 57	(20) 38	(15) 29	(15) 28	(10) 19	(10) 19	-
Total (1-7)	2,911.8		98	264	773	636	362	132	-
8. Physical Contingency	291.2		9.8	26.4	77.3	63.6	36.2	13.2	-
9. Total (1-8)	3,203.0		107.8	290.4	850.3	699.6	398.2	145.2	-
B. Indirect Project Cost									
1. On-farm facilities	220	0.783 (172)	-	(17) 29	(17) 29	(17) 29	(17) 29	(32) 56	-
2. Engineering	26	0.884 (23)	(15) 3	(15) 3	(15) 3	(15) 4	(15) 4	(25) 6	-
Total (1-2)	246		3	32	32	33	33	62	-
3. Physical Contingency	25		0.3	3.2	3.2	3.3	3.3	6.2	-
Total (1-3)	271		3.3	35.2	35.2	36.3	36.3	68.2	-
C. Project Economic Cost for Phase I (All Sector)									
			11.1	325.6	885.7	735.9	434.5	213.4	-

TABLE I-3-60-1 PROJECT ECONOMIC COST FOR PHASE I (All Sector) 2/2

Unit : million Baht

Works	Financial Cost	Weighted Conversion Factor	1991	1992	1993	1994	1995	1996	1997	1998
	(F/C + L/C)	(M. B.)	%	%	%	%	%	%	%	%
A. Direct Project Cost										
1. Preparatory Work	26	0.900 (23.4)	-	-	(100) 23.4	-	-	-	-	-
2. Construction Cost	allocated									
2.1 Diversion Dam	1,060	0.850 (901)	-	-	(5.7) 51	(12.3) 111	(27) 243	(40) 360	(15) 136	-
2.2 Tha Lat Irrigation	518	0.821 (425)	-	-	(8.7) 36	(19.0) 81	(25.8) 110	(25.8) 110	(17.4) 74	(3.3) 14
2.3 Si Yat Irrigation	365	0.823 (300)	-	-	-	(17.0) 51	(24) 72	(25) 75	(24) 72	(10) 30
Sub - Total (2)	1,943		-	-	87	243	425	545	282	44
3. Land Acquisition										
3.1 Resettle, Compensat.	454	0.920 (418)	-	(50) 209	(27.9) 117	(7.3) 30	(7.4) 31	(7.4) 31	-	-
3.2 O & M Equipment	11.3	0.968 (11)	-	-	(4.0) 5	-	-	-	(100) 11	-
3.3 Survey & Investigat.	14.6	0.920 (13)	-	(60) 8	(15) 18	(17) 20	(17) 20	(15) 18	(14) 17	(9) 11
3.4 Administration	130.0	0.920 (120)	-	(13) 16	(20) 35	(10) 17	(13.6) 23	(13.6) 23	(10) 17	(2.8) 5
3.5 Engineering Services	194	0.884 (171)	-	(30) 51	-	-	-	-	(10) 17	-
Total (1-7)	2,995.9		-	284	285.4	310	499	617	327	60
8. Physical Contingency	299.6		-	28.4	28.5	31.0	49.9	61.7	32.7	6.0
Total (1-8)	3,298.5		-	312.4	313.9	341	548.9	678.7	359.7	66.0
B. Indirect Project Cost										
1. On-farm facilities	452	0.783 (354)	-	-	(10) 35	(20) 71	(20) 71	(20) 71	(20) 71	(10) 35
2. Engineering	54	0.884 (48)	-	(15) 7	(15) 7	(15) 7	(15) 7	(15) 7	(15) 7	(10) 6
Total (1-2)	506		-	7	42	78	78	78	78	41
3. Physical Contingency	50		-	0.7	4.2	7.8	7.8	7.8	7.8	4.1
4. Indirect Cost Total	556		-	7.7	46.2	85.8	85.8	85.8	85.8	45.1
C. Project Economic Cost for Phase II										
(Phase I + Phase II) (All)			(111.1)	(645.7)	(1,245.8)	(1,162.7)	(1,069.2)	(977.9)	(445.5)	(111.1)

Table I.3.61

Landaquisition, Compensation and Resettlement Cost
- Financial and Economic -

unit: million Baht

A. Phase I	<u>Financial</u>	<u>Economic</u>
1. Bang Pakong Diversion Dam		
- Land aquisition and tree crop	70.7	- 1/
- Structure	9.0	9.0
- Land compensation	59.4	59.4
- Survey	15.6	- 2/
Sub-total:	<u>154.7</u>	<u>68.4</u>
2. Pumping station	5.0	5.0
3. Irrigation Canal	220.0	- 3/
Total:	<u>379.7</u>	<u>73.4</u>
B. Phase II		
1. Klong Si Yat Dam		
- Land acquisition	59.7	- 4/
- Tree crop	13.3	- 5/
- Structure	67.5	67.5
- Survey	9.5	- 6/
Sub-total:	<u>150.0</u>	
2. Irrigation canal	250.0	125.0 ^{7/}
3. Resettlement cost	280.0	261.5 ^{8/}
Total:	<u>680.0</u>	<u>454.0</u>

- Note: 1/ : Economic project cost is 0. However, in economic benefit flow, net production value for crops, fruit trees and fishery are estimated as lost value (- 0.7 million baht annually) from 1995 to 2039.
- 2/ and 6/ : Survey costs are included in Survey and investigation cost component.
- 3/ : Land acquisition cost for irrigation canal is 0. Value crops lost are considered as difference of cropping acreage for paddy with the project and without the project in the economic benefit flow.
- 4/ and 5/ : Economic project cost is 0. However, in economic benefit flow, net production value for crop and fruit trees are estimated as lost value. (- 18.9 million baht annually) from 1997 to 2039.
- 7/ : About 50 percent of land acquisition area are assumed as difference as the same with that of 3/.
- 8/ : Contingency value is included in Physical contingency cost component.

TABLE 1-3-62 PROJECT COST AND BENEFITS - BANG PAKONG RIVER BASIN - PHASE I - Agriculture
(UNIT : MILLION BAHT)

YEAR	PROJECT COST		TOTAL	BENEFITS	RETURN	3 %		10 %		12 %	
	CAPITAL	O & M				(COST)	(BENEFITS)	(COST)	(BENEFITS)	(COST)	(BENEFITS)
1 1990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1991	111.10	0.00	111.10	0.00	-111.10	95.25	0.00	91.82	0.00	88.57	0.00
3 1992	258.50	0.00	258.50	0.00	-258.50	205.21	0.00	194.22	0.00	184.00	0.00
4 1993	612.70	0.00	612.70	0.00	-612.70	450.35	0.00	418.48	0.00	389.38	0.00
5 1994	552.20	0.00	552.20	0.00	-552.20	375.82	0.00	342.87	0.00	315.33	0.00
6 1995	357.40	0.00	357.40	0.00	-357.40	225.22	0.00	201.74	0.00	181.07	0.00
7 1996	213.40	13.30	226.70	139.80	-87.20	132.28	81.40	116.33	71.59	102.55	63.10
8 1997	15.30	15.30	30.60	206.40	191.10	5.27	111.51	7.14	96.29	6.13	83.36
9 1998	0.00	15.30	15.30	407.20	391.90	7.65	203.70	6.49	172.69	5.52	146.84
10 1999	0.00	15.30	15.30	417.50	402.20	7.09	193.38	5.90	160.97	4.93	134.42
11 2000	0.00	15.30	15.30	426.10	410.80	6.56	182.75	5.36	149.35	4.40	122.49
12 2001	0.00	15.30	15.30	438.90	423.30	6.08	171.18	4.88	139.75	3.93	112.38
13 2002	0.00	15.30	15.30	440.00	424.70	5.65	161.79	4.43	127.45	3.51	100.84
14 2003	0.00	15.30	15.30	442.50	427.20	5.21	150.66	4.03	116.53	3.13	90.54
15 2004	0.00	15.30	15.30	445.90	430.60	4.82	140.57	3.66	106.75	2.80	81.45
16 2005	0.00	15.30	15.30	445.90	430.60	4.47	130.16	3.33	97.04	2.50	72.74
17 2006	0.00	15.30	15.30	445.90	430.60	4.14	120.51	3.03	88.22	2.23	64.84
18 2007	0.00	15.30	15.30	445.90	430.60	3.85	111.59	2.75	80.20	1.99	57.99
19 2008	0.00	15.30	15.30	445.90	430.60	3.58	103.52	2.50	72.91	1.78	51.77
20 2009	0.00	15.30	15.30	445.90	430.60	3.28	95.67	2.27	66.28	1.59	46.23
21 2010	0.00	15.30	15.30	445.90	430.60	3.04	88.58	2.07	60.28	1.42	41.27
22 2011	0.00	15.30	15.30	445.90	430.60	2.81	82.02	1.88	54.78	1.26	36.85
23 2012	0.00	15.30	15.30	445.90	430.60	2.61	75.94	1.71	49.80	1.13	32.90
24 2013	0.00	178.30	178.30	445.90	267.60	28.12	70.52	18.10	45.27	11.75	29.38
25 2014	0.00	15.30	15.30	445.90	430.60	2.25	65.11	1.41	41.16	0.90	26.32
26 2015	0.00	15.30	15.30	445.90	430.60	2.07	60.29	1.28	37.41	0.80	23.42
27 2016	0.00	15.30	15.30	445.90	430.60	1.92	55.82	1.17	34.01	0.72	20.91
28 2017	0.00	15.30	15.30	445.90	430.60	1.77	51.69	1.06	30.92	0.64	18.67
29 2018	0.00	15.30	15.30	445.90	430.60	1.64	47.86	0.96	28.11	0.57	16.67
30 2019	0.00	15.30	15.30	445.90	430.60	1.52	44.31	0.88	25.55	0.51	14.88
31 2020	0.00	15.30	15.30	445.90	430.60	1.41	41.05	0.80	23.23	0.46	13.29
32 2021	0.00	15.30	15.30	445.90	430.60	1.30	37.99	0.72	21.12	0.41	11.86
33 2022	0.00	15.30	15.30	445.90	430.60	1.21	35.18	0.66	19.20	0.36	10.59
34 2023	0.00	15.30	15.30	445.90	430.60	1.12	32.57	0.60	17.55	0.32	9.46
35 2024	0.00	15.30	15.30	445.90	430.60	1.05	30.16	0.54	15.87	0.29	8.45
36 2025	0.00	15.30	15.30	445.90	430.60	0.96	27.92	0.49	14.42	0.26	7.54
37 2026	0.00	15.30	15.30	445.90	430.60	0.89	25.86	0.45	13.11	0.23	6.73
38 2027	0.00	15.30	15.30	445.90	430.60	0.82	23.94	0.41	11.92	0.21	6.01
39 2028	0.00	15.30	15.30	445.90	430.60	0.76	22.17	0.37	10.84	0.18	5.37
40 2029	0.00	15.30	15.30	445.90	430.60	0.70	20.53	0.34	9.85	0.16	4.79
41 2030	0.00	15.30	15.30	445.90	430.60	0.65	19.01	0.31	8.96	0.15	4.28
42 2031	0.00	15.30	15.30	445.90	430.60	0.60	17.60	0.28	8.14	0.13	3.82
43 2032	0.00	15.30	15.30	445.90	430.60	0.56	16.29	0.25	7.40	0.12	3.41
44 2033	0.00	178.30	178.30	445.90	267.60	6.05	15.09	2.69	6.12	1.22	3.05
45 2034	0.00	15.30	15.30	445.90	430.60	0.48	13.97	0.21	5.12	0.09	2.72
46 2035	0.00	15.30	15.30	445.90	430.60	0.44	12.93	0.19	4.56	0.08	2.47
47 2036	0.00	15.30	15.30	445.90	430.60	0.41	11.98	0.17	4.06	0.07	2.17
48 2037	0.00	15.30	15.30	445.90	430.60	0.38	11.09	0.16	3.60	0.07	1.94
49 2038	0.00	15.30	15.30	445.90	430.60	0.35	10.27	0.14	3.18	0.06	1.73
50 2039	0.00	15.30	15.30	445.90	430.60	0.33	9.51	0.13	2.80	0.05	1.54
TOTAL	2105.30	997.20	3102.50	18970.20	15867.70	1822.87	3038.19	1461.69	2170.85	1327.98	1601.67

BENEFIT COST RATIO BY DISCOUNT RATE (B/C) = 1.87 (8%), 1.49 (10%), 1.21 (12%)
INTERNAL RATE OF RETURN (IRR) = 14.0 %

TABLE I-3-62-1 PROJECT COST AND BENEFITS, BANG PAKONG RIVER BASIN, - PHASE I - Tentative
(UNIT : MILLION BAHT)

YEAR	PROJECT COST		O & M	TOTAL	BENEFITS	RETURN	PRESENT WORTH VALUE BY DISCOUNT RATE			12 % (BENEFITS)
	CAPITAL						(COST)	(BENEFITS)	(COST)	
1 1990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1991	111.10	0.00	0.00	111.10	0.00	-111.10	95.25	91.82	0.00	88.57
3 1992	258.50	0.00	0.00	258.50	0.00	-258.50	205.21	194.22	0.00	184.00
4 1993	612.70	0.00	0.00	612.70	0.00	-612.70	450.35	418.48	0.00	389.58
5 1994	552.20	0.00	0.00	552.20	0.00	-552.20	375.82	342.87	0.00	313.33
6 1995	517.40	0.00	0.00	517.40	0.00	-517.40	225.22	201.74	0.00	181.07
7 1996	213.40	13.30	13.30	226.70	129.10	-97.60	132.28	116.33	66.25	102.55
8 1997	0.00	15.30	15.30	15.30	195.70	180.40	8.27	7.14	91.30	6.18
9 1998	0.00	15.30	15.30	15.30	393.00	377.70	7.65	6.49	166.67	5.32
10 2000	0.00	15.30	15.30	15.30	403.40	388.10	7.09	5.90	155.53	4.93
11 2000	0.00	15.30	15.30	15.30	412.60	397.50	6.56	5.36	144.62	4.40
12 2001	0.00	15.30	15.30	15.30	421.10	405.80	6.08	4.88	134.18	3.93
13 2002	0.00	15.30	15.30	15.30	425.70	410.40	5.63	4.43	123.51	3.51
14 2003	0.00	15.30	15.30	15.30	428.20	412.90	5.21	4.03	112.76	3.13
15 2004	0.00	15.30	15.30	15.30	428.20	412.90	4.82	3.66	102.51	2.80
16 2005	0.00	15.30	15.30	15.30	428.20	412.90	4.47	3.33	93.19	2.50
17 2006	0.00	15.30	15.30	15.30	428.20	412.90	4.14	3.03	84.72	2.23
18 2007	0.00	15.30	15.30	15.30	428.20	412.90	3.85	2.75	77.02	1.99
19 2008	0.00	15.30	15.30	15.30	428.20	412.90	3.55	2.50	70.02	1.78
20 2009	0.00	15.30	15.30	15.30	428.20	412.90	3.28	2.27	63.65	1.59
21 2010	0.00	15.30	15.30	15.30	428.20	412.90	3.04	2.07	57.86	1.42
22 2011	0.00	15.30	15.30	15.30	428.20	412.90	2.81	1.88	52.60	1.26
23 2012	0.00	15.30	15.30	15.30	428.20	412.90	2.61	1.71	47.82	1.13
24 2013	0.00	15.30	15.30	15.30	428.20	412.90	2.42	1.56	43.47	1.01
25 2014	0.00	15.30	15.30	15.30	428.20	412.90	2.25	1.41	39.52	0.90
26 2015	0.00	15.30	15.30	15.30	428.20	412.90	2.07	1.28	35.93	0.80
27 2016	0.00	15.30	15.30	15.30	428.20	412.90	1.92	1.17	32.66	0.72
28 2017	0.00	15.30	15.30	15.30	428.20	412.90	1.77	1.06	29.69	0.64
29 2018	0.00	15.30	15.30	15.30	428.20	412.90	1.64	0.96	26.99	0.57
30 2019	0.00	15.30	15.30	15.30	428.20	412.90	1.52	0.88	24.54	0.51
31 2020	0.00	15.30	15.30	15.30	428.20	412.90	1.41	0.80	22.31	0.46
32 2021	0.00	15.30	15.30	15.30	428.20	412.90	1.30	0.72	20.28	0.41
33 2022	0.00	15.30	15.30	15.30	428.20	412.90	1.21	0.66	18.44	0.36
34 2023	0.00	15.30	15.30	15.30	428.20	412.90	1.12	0.60	16.76	0.32
35 2024	0.00	15.30	15.30	15.30	428.20	412.90	1.03	0.54	15.24	0.29
36 2025	0.00	15.30	15.30	15.30	428.20	412.90	0.96	0.49	13.85	0.26
37 2026	0.00	15.30	15.30	15.30	428.20	412.90	0.89	0.45	12.59	0.23
38 2027	0.00	15.30	15.30	15.30	428.20	412.90	0.82	0.41	11.45	0.21
39 2028	0.00	15.30	15.30	15.30	428.20	412.90	0.76	0.37	10.41	0.18
40 2029	0.00	15.30	15.30	15.30	428.20	412.90	0.70	0.34	9.46	0.16
41 2030	0.00	15.30	15.30	15.30	428.20	412.90	0.65	0.31	8.60	0.15
42 2031	0.00	15.30	15.30	15.30	428.20	412.90	0.60	0.28	7.82	0.13
43 2032	0.00	15.30	15.30	15.30	428.20	412.90	0.56	0.25	7.11	0.12
44 2033	0.00	15.30	15.30	15.30	428.20	412.90	0.53	0.23	6.46	0.11
45 2034	0.00	15.30	15.30	15.30	428.20	412.90	0.48	0.21	5.87	0.09
46 2035	0.00	15.30	15.30	15.30	428.20	412.90	0.44	0.19	5.34	0.08
47 2036	0.00	15.30	15.30	15.30	428.20	412.90	0.41	0.17	4.86	0.07
48 2037	0.00	15.30	15.30	15.30	428.20	412.90	0.38	0.16	4.41	0.07
49 2038	0.00	15.30	15.30	15.30	428.20	412.90	0.35	0.14	4.01	0.06
50 2039	0.00	15.30	15.30	15.30	428.20	412.90	0.33	0.13	3.65	0.05
TOTAL	2105.30	997.20	3102.50	18224.00	15121.50	1622.87	2919.23	1461.69	2085.74	1327.98

BENEFIT COST RATIO BY DISCOUNT RATE (B/C) = 1.80 (8%), 1.43 (10%), 1.16 (12%)
INTERNAL RATE OF RETURN (IRR) = 13.6%

TABLE 3-3-63 PROJECT COST AND BENEFITS / BANG PAKONG RIVER BASIN / PHASE II AGRICULTURE
(UNIT : MILLION BART)

YEAR	PROJECT COST		TOTAL	BENEFITS	RETURN	8 %		10 %		12 %	
	CAPITAL	O & M				(COST)	(BENEFITS)	(COST)	(BENEFITS)	(COST)	(BENEFITS)
1 1990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1991	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3 1992	330.10	0.00	330.10	0.00	-320.10	254.11	0.00	240.50	0.00	227.84	0.00
4 1993	339.20	0.00	339.20	0.00	-339.20	259.78	0.00	237.68	0.00	215.57	0.00
5 1994	381.70	0.00	381.70	0.00	-381.70	340.10	0.00	304.65	0.00	273.43	0.00
6 1995	535.70	4.00	539.70	-3.10	-542.80	363.69	13.30	319.85	-1.75	281.95	10.31
7 1996	619.30	7.50	626.80	38.10	-600.50	214.63	20.58	185.16	17.77	160.30	15.39
8 1997	389.40	16.20	405.60	180.40	-358.80	63.68	90.23	53.99	78.51	45.91	15.05
9 1998	111.10	19.70	130.80	282.10	202.40	9.12	102.88	7.60	85.63	6.34	71.51
10 1999	0.00	19.70	19.70	251.40	231.70	8.45	107.82	6.90	88.12	5.66	72.27
11 2000	0.00	19.70	19.70	239.70	220.00	7.82	95.19	6.28	76.38	5.06	61.53
12 2001	0.00	19.70	19.70	223.00	223.30	7.24	89.35	5.71	70.39	4.51	55.69
13 2002	0.00	19.70	19.70	243.00	227.80	6.71	84.26	5.19	63.18	4.03	50.64
14 2003	0.00	19.70	19.70	264.00	244.30	6.21	83.22	4.72	63.20	3.60	48.23
15 2004	0.00	19.70	19.70	301.50	281.80	5.75	88.01	4.29	65.62	3.21	49.18
16 2005	0.00	19.70	19.70	338.30	338.60	5.32	96.84	3.90	70.89	2.87	52.18
17 2006	0.00	19.70	19.70	416.50	396.80	4.93	104.23	3.54	74.91	2.56	54.16
18 2007	0.00	19.70	19.70	458.30	438.50	4.56	106.17	3.22	71.92	2.29	53.20
19 2008	0.00	19.70	19.70	484.20	464.50	4.23	103.89	2.93	71.97	2.04	50.20
20 2009	0.00	19.70	19.70	484.20	464.50	3.91	96.19	2.66	65.43	1.82	44.82
21 2010	0.00	19.70	19.70	484.20	464.50	3.62	89.07	2.42	59.48	1.63	40.02
22 2011	0.00	19.70	19.70	484.20	464.50	3.36	82.47	2.20	54.08	1.45	35.73
23 2012	0.00	19.70	19.70	484.20	464.50	3.11	76.36	2.00	49.16	1.30	31.90
24 2013	0.00	19.70	19.70	484.20	464.50	2.88	70.70	1.82	44.69	1.16	28.48
25 2014	0.00	19.70	19.70	484.20	464.50	2.66	65.47	1.65	40.63	1.03	25.43
26 2015	0.00	19.70	19.70	484.20	464.50	2.47	60.62	1.50	36.93	0.92	22.71
27 2016	0.00	19.70	19.70	484.20	464.50	2.28	56.13	1.37	33.58	0.82	20.27
28 2017	0.00	19.70	19.70	484.20	464.40	2.13	51.97	1.25	30.52	0.74	18.10
29 2018	0.00	19.80	19.80	484.20	464.50	1.96	48.12	1.13	27.75	0.66	16.16
30 2019	0.00	19.70	19.70	484.20	464.50	1.81	44.53	1.03	25.23	0.59	14.43
31 2020	0.00	19.70	19.70	484.20	464.50	1.68	41.25	0.93	22.93	0.52	12.88
32 2021	0.00	19.70	19.70	484.20	464.50	1.55	38.20	0.85	20.85	0.47	11.50
33 2022	0.00	19.70	19.70	484.20	464.50	1.44	35.37	0.77	18.93	0.42	10.27
34 2023	0.00	19.70	19.70	484.20	464.50	1.33	32.75	0.70	17.23	0.37	9.17
35 2024	0.00	19.70	19.70	484.20	464.50	1.23	30.32	0.64	15.66	0.33	8.19
36 2025	0.00	19.70	19.70	484.20	464.50	1.14	28.08	0.58	14.24	0.30	7.31
37 2026	0.00	19.70	19.70	484.20	464.50	1.06	26.00	0.53	12.95	0.27	6.53
38 2027	0.00	19.70	19.70	484.20	464.50	0.98	24.07	0.48	11.77	0.24	5.83
39 2028	0.00	19.70	19.70	484.20	464.50	0.91	22.29	0.44	10.70	0.21	5.20
40 2029	0.00	19.70	19.70	484.20	464.50	0.84	20.64	0.40	9.73	0.19	4.65
41 2030	0.00	19.70	19.70	484.20	464.50	0.78	19.11	0.36	8.84	0.17	4.15
42 2031	0.00	19.70	19.70	484.20	464.50	0.72	17.69	0.33	8.04	0.15	3.70
43 2032	0.00	19.70	19.70	484.20	464.50	0.67	16.38	0.30	7.31	0.13	3.31
44 2033	0.00	19.70	19.70	484.20	464.50	0.62	15.17	0.27	6.64	0.12	2.95
45 2034	0.00	19.70	19.70	484.20	464.50	0.57	14.05	0.25	6.04	0.11	2.64
46 2035	0.00	19.70	19.70	484.20	464.50	0.53	13.01	0.22	5.49	0.10	2.35
47 2036	0.00	19.70	19.70	484.20	464.50	0.49	12.04	0.20	4.99	0.09	2.10
48 2037	0.00	19.80	19.80	484.20	464.40	0.46	11.15	0.19	4.54	0.08	1.88
49 2038	0.00	19.70	19.70	484.20	464.50	0.42	10.32	0.17	4.12	0.07	1.68
50 2039	0.00	19.70	19.70	484.20	464.50	0.42	10.32	0.17	4.12	0.07	1.68
TOTAL	2696.50	839.60	3536.10	18350.60	14714.50	1863.07	2353.56	1654.71	1589.93	1480.22	1112.32

BENEFIT COST RATIO BY DISCOUNT RATE (B/C) = 1.26 (8%), 0.96 (10%), 0.75 (12%)
INTERNAL RATE OF RETURN (IRR) = 9.7 %

TABLE 13-64 PROJECT COST AND BENEFITS, BANG PAKONG RIVER BASIN - OVERALL PROJECT - Agriculture
(UNIT : MILLION BAHT)

YEAR	PROJECT COST		RETURN	PRESENT WORTH VALUE BY DISCOUNT RATE		(BENEFITS)	(COST)	10 %	(BENEFITS)	(COST)	12 %	(BENEFITS)
	CAPITAL	O & M		TOTAL	(BENEFITS)							
1 1990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1991	111.10	0.00	-111.10	0.00	91.82	0.00	88.57	0.00	0.00	88.57	0.00	0.00
3 1992	578.60	0.00	-578.60	0.00	454.71	0.00	411.84	0.00	0.00	411.84	0.00	0.00
4 1993	951.90	0.00	-951.90	0.00	650.16	0.00	604.95	0.00	0.00	604.95	0.00	0.00
5 1994	933.90	4.00	-937.90	0.00	582.36	0.00	532.19	0.00	0.00	532.19	0.00	0.00
6 1995	882.10	17.30	-914.20	-5.10	513.90	-2.39	461.24	-2.15	0.00	461.24	-1.95	0.00
7 1996	852.70	22.80	-855.50	162.50	439.01	94.70	386.99	83.29	0.00	386.99	73.42	0.00
8 1997	589.40	31.50	-176.40	244.50	132.10	132.10	114.06	149.35	0.00	170.00	98.75	0.00
9 1998	111.10	55.00	44.10	587.60	73.09	249.20	249.20	61.96	0.00	52.69	11.27	0.00
10 1999	0.00	35.00	64.60	639.60	16.21	296.26	248.60	13.49	0.00	11.27	0.00	0.00
11 2000	0.00	35.00	64.60	677.50	15.01	290.57	257.46	12.27	0.00	10.06	0.00	0.00
12 2001	0.00	35.00	64.60	675.50	15.90	268.17	215.17	11.15	0.00	8.98	0.00	0.00
13 2002	0.00	35.00	64.60	683.00	12.87	251.14	197.84	10.14	0.00	8.02	0.00	0.00
14 2003	0.00	35.00	65.00	690.00	11.92	234.92	181.70	9.22	0.00	7.16	0.00	0.00
15 2004	0.00	35.00	64.90	709.90	11.03	223.79	169.95	8.38	0.00	6.39	0.00	0.00
16 2005	0.00	35.00	74.40	747.40	10.22	218.16	162.66	7.62	0.00	5.71	0.00	0.00
17 2006	0.00	35.00	76.20	804.20	9.46	217.35	159.11	6.92	0.00	5.10	0.00	0.00
18 2007	0.00	35.00	82.20	862.20	8.76	215.77	155.08	6.30	0.00	4.55	0.00	0.00
19 2008	0.00	35.00	89.10	904.10	8.11	209.49	147.83	5.72	0.00	4.06	0.00	0.00
20 2009	0.00	35.00	89.10	930.10	7.51	199.55	138.26	5.20	0.00	3.63	0.00	0.00
21 2010	0.00	35.00	89.10	930.10	6.95	184.77	125.69	4.75	0.00	3.24	0.00	0.00
22 2011	0.00	35.00	89.10	930.10	6.44	171.09	114.26	4.30	0.00	2.89	0.00	0.00
23 2012	0.00	35.00	89.10	930.10	5.96	158.41	103.87	3.91	0.00	2.58	0.00	0.00
24 2013	198.00	35.00	732.10	930.10	5.51	146.68	94.43	3.50	15.04	15.04	61.28	0.00
25 2014	0.00	35.00	89.10	930.10	5.11	135.81	85.85	3.25	2.06	2.06	54.71	0.00
26 2015	0.00	35.00	89.10	930.10	4.73	125.75	78.04	2.94	1.84	1.84	48.85	0.00
27 2016	0.00	35.00	89.10	930.10	4.38	116.44	70.95	2.67	1.64	1.64	45.62	0.00
28 2017	0.00	35.00	89.10	930.10	4.06	107.81	64.50	2.45	1.47	1.47	43.62	0.00
29 2018	0.00	35.00	89.10	930.10	3.77	99.83	58.63	2.21	1.31	1.31	41.77	0.00
30 2019	0.00	35.00	89.10	930.10	3.48	92.43	53.50	2.01	1.17	1.17	39.05	0.00
31 2020	0.00	35.00	89.10	930.10	3.22	85.59	48.46	1.82	1.04	1.04	37.02	0.00
32 2021	0.00	35.00	89.10	930.10	2.98	79.19	44.05	1.66	0.93	0.93	34.73	0.00
33 2022	0.00	35.00	89.10	930.10	2.76	73.58	40.05	1.51	0.83	0.83	32.10	0.00
34 2023	0.00	35.00	89.10	930.10	2.56	67.64	36.41	1.37	0.74	0.74	29.73	0.00
35 2024	0.00	35.00	89.10	930.10	2.37	62.21	33.10	1.25	0.66	0.66	27.15	0.00
36 2025	0.00	35.00	89.10	930.10	2.19	58.23	30.09	1.13	0.59	0.59	24.73	0.00
37 2026	0.00	35.00	89.10	930.10	2.03	53.93	27.35	1.03	0.53	0.53	22.10	0.00
38 2027	0.00	35.00	89.10	930.10	1.88	49.94	24.87	0.94	0.47	0.47	19.54	0.00
39 2028	0.00	35.00	89.10	930.10	1.74	46.24	22.61	0.85	0.42	0.42	17.20	0.00
40 2029	0.00	35.00	89.10	930.10	1.61	42.81	20.55	0.77	0.38	0.38	14.80	0.00
41 2030	0.00	35.00	89.10	930.10	1.49	39.64	18.68	0.70	0.34	0.34	12.54	0.00
42 2031	0.00	35.00	89.10	930.10	1.38	36.71	16.98	0.64	0.30	0.30	10.32	0.00
43 2032	0.00	35.00	89.10	930.10	1.28	33.99	15.44	0.58	0.27	0.27	8.15	0.00
44 2033	198.00	35.00	732.10	930.10	1.19	31.47	14.04	0.53	0.25	0.25	6.02	0.00
45 2034	0.00	35.00	89.10	930.10	1.10	29.14	12.76	0.48	0.21	0.21	4.97	0.00
46 2035	0.00	35.00	89.10	930.10	1.02	26.98	11.60	0.44	0.19	0.19	4.04	0.00
47 2036	0.00	35.00	89.10	930.10	0.94	24.98	10.55	0.40	0.17	0.17	3.24	0.00
48 2037	0.00	35.00	89.10	930.10	0.87	23.13	9.59	0.36	0.15	0.15	2.54	0.00
49 2038	0.00	35.10	89.10	930.10	0.81	21.42	8.72	0.33	0.14	0.14	1.94	0.00
50 2039	0.00	35.00	89.10	930.10	0.75	19.83	7.92	0.30	0.12	0.12	1.42	0.00
TOTAL	4801.80	1871.80	6673.60	37216.90	30543.50	5390.08	3134.75	3759.39	2824.48	2712.81	0.00	0.00

BENEFIT COST RATIO BY DISCOUNT RATE (B/C) = 1.54 (82%), 1.20 (102%), 0.96 (12%)
INTERNAL RATE OF RETURN (IRR) = 11.7 %

TABLE 1-3-64-1 PROJECT COST AND BENEFITS, BANG PAKONG RIVER BASIN, (ALL SECTOR) (UNIT : MILLION BAHT)

YEAR	PROJECT COST		TOTAL	BENEFITS	RETURN	8 %		10 %		12 %	
	CAPITAL	O & M				(COST)	(BENEFITS)	(COST)	(BENEFITS)	(COST)	(BENEFITS)
1 1990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1991	111.10	0.00	111.10	0.00	-111.10	95.25	0.00	91.32	0.00	88.57	0.00
3 1992	645.70	0.00	645.70	0.00	-645.70	512.58	0.00	485.12	0.00	459.60	0.00
4 1993	1245.80	0.00	1245.80	0.00	-1245.80	915.70	0.00	850.90	0.00	791.73	0.00
5 1994	1162.70	0.00	1162.70	0.00	-1162.70	791.32	0.00	721.95	0.00	659.75	0.00
6 1995	1069.20	0.00	1069.20	3.10	-1076.30	676.30	-1.95	605.80	-1.75	543.72	-1.57
7 1996	977.90	17.50	995.20	224.70	-773.50	580.69	129.36	510.70	115.77	450.18	100.29
8 1997	445.50	22.80	468.30	319.30	-149.00	253.01	172.51	218.47	148.96	189.14	128.96
9 1998	111.10	31.50	142.60	715.90	573.30	71.34	358.13	60.48	303.61	51.42	258.16
10 1999	0.00	35.00	35.00	793.30	758.30	16.21	367.45	13.49	305.85	11.27	255.42
11 2000	0.00	35.00	35.00	867.80	832.60	15.01	372.10	12.57	304.09	10.06	249.42
12 2001	0.00	35.00	35.00	840.30	840.30	13.90	347.60	11.15	278.90	8.98	224.67
13 2002	0.00	35.00	35.00	899.90	864.90	12.87	330.89	10.14	260.67	8.02	206.25
14 2003	0.00	35.00	35.00	906.90	871.90	11.92	308.77	9.22	238.82	7.16	185.57
15 2004	0.00	35.00	35.00	926.80	891.80	11.05	292.17	8.56	221.87	6.39	169.32
16 2005	0.00	35.00	35.00	964.30	929.30	10.22	281.47	7.62	209.86	5.71	157.30
17 2006	0.00	35.00	35.00	1031.10	986.10	9.46	275.97	6.92	202.02	5.10	148.72
18 2007	0.00	35.00	35.00	1079.10	1044.10	8.76	270.05	6.30	194.09	4.55	140.33
19 2008	0.00	35.00	35.00	1121.00	1086.00	8.11	259.75	5.72	183.30	4.06	130.16
20 2009	0.00	35.00	35.00	1147.00	1112.00	7.51	246.09	5.20	170.50	3.65	118.91
21 2010	0.00	35.00	35.00	1147.00	1112.00	6.95	227.86	4.73	155.00	3.24	106.17
22 2011	0.00	35.00	35.00	1147.00	1112.00	6.44	210.98	4.30	140.91	2.89	94.79
23 2012	0.00	35.00	35.00	1147.00	1112.00	5.96	195.35	3.91	128.10	2.58	84.64
24 2013	0.00	198.00	198.00	1147.00	949.00	5.11	180.88	20.10	116.45	13.04	75.57
25 2014	0.00	35.00	35.00	1147.00	1112.00	4.73	167.48	3.23	105.87	2.06	67.47
26 2015	0.00	35.00	35.00	1147.00	1112.00	4.38	155.08	2.94	96.24	1.84	60.24
27 2016	0.00	35.00	35.00	1147.00	1112.00	4.06	143.59	2.67	87.49	1.64	53.79
28 2017	0.00	35.00	35.00	1147.00	1112.00	3.77	132.96	2.43	79.54	1.47	48.02
29 2018	0.00	35.10	35.10	1147.00	1111.90	3.48	123.11	2.21	72.31	1.31	42.88
30 2019	0.00	35.00	35.00	1147.00	1112.00	3.22	113.99	2.01	65.73	1.17	38.28
31 2020	0.00	35.00	35.00	1147.00	1112.00	2.98	105.54	1.82	59.76	1.04	34.18
32 2021	0.00	35.00	35.00	1147.00	1112.00	2.76	97.73	1.66	54.33	0.93	30.52
33 2022	0.00	35.00	35.00	1147.00	1112.00	2.56	90.49	1.51	49.39	0.85	27.25
34 2023	0.00	35.00	35.00	1147.00	1112.00	2.37	83.78	1.37	44.90	0.74	24.33
35 2024	0.00	35.00	35.00	1147.00	1112.00	2.19	77.58	1.25	40.82	0.66	21.72
36 2025	0.00	35.00	35.00	1147.00	1112.00	2.03	71.83	1.13	37.11	0.59	19.40
37 2026	0.00	35.00	35.00	1147.00	1112.00	1.88	66.51	1.03	33.73	0.53	17.32
38 2027	0.00	35.00	35.00	1147.00	1112.00	1.74	61.58	0.94	30.67	0.47	15.46
39 2028	0.00	35.00	35.00	1147.00	1112.00	1.61	57.02	0.85	27.88	0.42	13.81
40 2029	0.00	35.00	35.00	1147.00	1112.00	1.49	52.80	0.77	25.34	0.38	12.33
41 2030	0.00	35.00	35.00	1147.00	1112.00	1.38	48.89	0.70	23.04	0.34	11.01
42 2031	0.00	35.00	35.00	1147.00	1112.00	1.28	45.27	0.64	20.95	0.27	9.83
43 2032	0.00	35.00	35.00	1147.00	1112.00	1.28	41.91	0.58	19.04	0.27	8.77
44 2033	0.00	198.00	198.00	1147.00	949.00	1.10	38.81	0.58	17.51	0.21	7.85
45 2034	0.00	35.00	35.00	1147.00	1112.00	1.02	35.93	0.48	15.74	0.21	6.99
46 2035	0.00	35.00	35.00	1147.00	1112.00	0.94	33.27	0.44	14.31	0.19	6.25
47 2036	0.00	35.00	35.00	1147.00	1112.00	0.87	30.81	0.40	13.01	0.17	5.58
48 2037	0.00	35.00	35.00	1147.00	1112.00	0.81	28.53	0.36	11.82	0.15	4.98
49 2038	0.00	35.10	35.10	1147.00	1111.90	0.75	26.41	0.33	10.75	0.14	4.45
50 2039	0.00	35.00	35.00	1147.00	1112.00	0.75	24.46	0.30	9.77	0.12	3.97
TOTAL	5749.00	1836.80	7605.80	46266.10	38660.30	4136.95	6780.80	3709.70	4741.84	3350.15	3429.70

BENEFIT COST RATIO BY DISCOUNT RATE (B/C) = 1.64 (8%), 1.28 (10%), 1.02 (12%)
INTERNAL RATE OF RETURN (IRR) = 12.2 %

Table I.3.65 Annual Repayment Cost per ha.

unit: million Baht

Item	Phase I	Phase II	Total
1. On-farm facilities	220	452	672
2. Engineering cost	26	54	80
3. Physical Contingency	25	50	75
4. Price escalation	54	147	201
Total	325	703	1,028
5. Irrigable area (ha)	14,700	29,200	43,900
6. Cost per ha. (Baht)	22,110	24,100	23,420
7. Annual repayment per ha. (Baht)			
Capital cost (1/20)	1,105	1,205	
Interest (0.11 x 20)	2,431	2,651	
Total repayment	3,536	3,856	

Note: According to the annual report of BAAC, long term loans for investment in a agriculture is as follows:

1. Long term loans for investment in agriculture are provided to enable farmer borrowers to purchase or develop agricultural resources or invest in agricultural assets requiring a lengthy period of time before the farmer starts to receive a return on his investment. The proceeds of most long term loans are utilized to purchase, develop, or consolidate land for agriculture, or to purchase, construct, or upgrade fixed assets such as farm buildings and farm implements. Repayment is by instalment within a period of 15 years, or 20 years in special cases, and farmers must submit their applications in the form of detailed long term agricultural investment projects for the Bank's consideration. In addition, farmer applicants must finish an equity contribution of not less than 20 % of the project's total investment costs, and are required to secure the loan either by the use of two personal guarantors or by mortgaging fixed assets with the Bank.
2. Interest rates are 11 % simple interest (Annual report, 1981).

Table I.3.66

Land Use with & without the Project

unit: ha

Crop	Exist.Tha Lat Area		Tha Lat Expan.Area		Exist.Bang Pak.Area		Bang Pak.Expan.Area	
	WO/Pro.	W/Pro.	WO/Pro.	W/Pro.	WO/Pro.	W/Pro.	WO/Pro.	W/Pro.
Irrigable area	21,100	24,100	6,150	7,100	12,300	12,300	2,000	2,000
Wet season								
Paddy	21,100	21,100	3,610	3,400	10,000	9,900	-	-
Maize	-	-	-	700	-	-	-	-
Cassava	-	-	2,540	-	-	-	-	-
Orchard	-	-	-	3,000	2,110	2,210	1,950	1,950
Vegetable	-	-	-	-	190	190	50	50
Total	21,100	24,100	6,150	7,100	12,300	12,300	2,000	2,000
Dry season								
Paddy	160	4,220	-	680	-	1,980	-	-
Soybean	-	2,040	-	1,030	-	280	-	-
G. Nuts	-	1,200	-	810	-	920	-	-
Mung B.	-	1,380	-	-	-	1,780	-	-
Maize	-	-	-	460	-	-	-	-
Orchard	-	-	-	3,000	-	2,210	-	1,950
Vegetable	-	1,980	-	230	-	2,060	-	80
Total	160	10,820	-	6,210	-	9,230	-	2,030

Table I.3.67 Cropping Pattern with & without the Project

unit: %

Crop	Exist. Tha Lat Area		Tha Lat Expan. Area		Exist. Bang Pak. Area		Bang Pak. Expan. Area	
	WO/Pro.	W/Pro.	WO/Pro.	W/Pro.	WO/Pro.	W/Pro.	WO/Pro.	W/Pro.
Wet season								
Paddy	100	100	58.7	47.9	81.3	80.5	-	-
Maize	-	-	-	9.8	-	-	-	-
Cassava	-	-	41.3	-	-	-	-	-
Orchard	-	-	-	42.3	17.2	18.0	97.5	97.5
Vegetable	-	-	-	-	1.5	1.5	2.5	2.5
Total	100	100	100	100	100	100	100	100
Dry season								
Paddy	0.76	20	-	9.6	-	16.1	-	-
Soybean	-	9.7	-	14.5	-	2.3	-	-
G. Nuts	-	5.7	-	11.4	-	7.5	-	-
Mung B.	-	6.5	-	-	-	14.5	-	-
Maize	-	-	-	6.5	-	-	-	-
Orchard	-	-	-	(42.3)	-	(18.0)	-	(97.5)
Vegetable	-	9.4	-	3.2	-	16.6	-	4
Total	0.76	51.3	-	87.5	-	75.0	-	101.5

I-3-9 Joint Cost Allocation

1. Conception

The multipurpose facilities in Tha Lat River Basin Development Project are constructed by Royal Irrigation Department. The construction costs are procured not by co-finance of irrigation, industry and drinking water sector but by an RID's finance. Operation and maintenance costs of common facilities are also burdened not by co-finance of respective beneficial authority but the RID.

Under these financial situation on implementation and operation/maintenance of multipurpose facilities the following problems shall be pointed out.

- Since cost sharing by respective beneficiaries is not respective administratively, water tariff or water charge estimated in drinking water authority or industrial factory does not includes cost of water produced by use of water stored in common facilities. In a view point of national economy, it is considered that water charge to be collected from industry or drinking water sector is subsidized on water cost portion.

- Even though cost allocation is not regulated financially, economic efficiency of the project by sector must not be neglected.

The opportunity of developing water resources for agricultural purpose lies under difficult situation due to the declining trend in the prices of agriculture produce.

But the opportunity will be given formulation of multipurpose project which is economically feasible enable non-feasible irrigation project to participate to the project.

Because non-feasible economy of the irrigation project will be improved to feasible economy through cost allocation of multipurpose facilities.

- If cost sharing by respective beneficiaries is not clear, cost recovery study for each sector will not be enoughly executed.

2. Cost Allocation

Cost allocation on Bang Pakong Diversion Dam and Khlong Si Yat Storage Dam are studied as follows.

i. Physical scope of common facilities

- khlong Si Yat storage dam

Dam height	: 33.5 m, Crest length : 2,640 m
Active storage	: 300 million m ³
Total storage	: 325 million m ³

- Bang Pakong diversion dam

Weir width	: about 280 m
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ii. Executing agency

- Khlong Si Yat storage dam : RID
- Bang Pakong diversion dam : RID

iii. Authorities to control the user supplied water from common facilities.

- Irrigation (include fishery sector): RID
- Industrial water : Industrial Estate Authority of Thailand (IEAT)
- Drinking water : Provincial Water Work Authority (PWA)
Public Work Department (PWP)
Sanitary District

iv. Cost allocation

Participation with cost allocation by sector to use water is categorized by two types. One type is allocation of each dam cost.

Another type is comprehensive allocation of costs totalized with Khlong Si Yat storage dam and Bang Pakong diversion dam.

In this study, considering the following hydrological items, comprehensive cost allocation method is adaptable.

The reservoir volume of Bang Pakong diversion dam is only for 30 MCM, but the stored water is rotated in a high efficiency through supply from Si Yat dam, Rabon dam and runoff from upper stream of Bang Pakong river.

Hence, the user to be directly supplied water through Bang Pakong diversion dam should also participate in allocation of Si Yat dam cost.

a) Total cost of both common facilities are allocated by benefits value generated from the following sectors

- Irrigation : 43,900 ha (Phase1 : 14,700ha Phase2 : 29,200ha)
- Industry : Water quantities supplied by both dam.
- Drinking : Water quantities supplied by both dam.

b) As the first step, separable cost alternative justifiable expenditure method is adaptable. Ratio allocated to each sector is estimated as follows. (See Table I-3-68)

- Irrigation sector about 47 %
- Industry and drinking water sector about 53 %

c) Allocation method mentioned above is not always adaptable with respect to the following reasons.

- Cost allocated to industry and drinking water sector results in high costs of raw water production as 9.4 Baht per CM. In the result, water requirements of industry and drinking water sector may be reduced.

On the other hand, cost-benefit ratio for irrigation sector is estimated at 1.32, This means that the remaining benefits value are surplus to be bearable more high rate.

- Urgent necessity of water requirements is different by sector. In this project, water requirement by industry and drinking water sector is under very urgent situation. Considering two items mentioned above, cost allocation has to be undertaken based on another method.

d) As the second step, total costs of both common facilities are allocated by water quantities by sector supplied from Si Yat dam, Diversion dam and Rabon dam. these water quantities are estimated as follows.

Item	Irrigation (MCM)	Industry and drinking (MCM)	Note
Phase 1	83.5	120.0	during dry season
Phase 2	265	85.0	during both season
Total	348.5	205.0	
Ratio allocated	63 %	37 %	

- Under these ratios, cost-benefit ratio for irrigation sector is estimated at 1.16. Water cost for industry and drinking water sector is estimated at 6.6 Baht per CM.

e) Conclusion

- Adaptable cost allocation method has to be satisfied by both factors, that is, financial justification for irrigation sector and reasonable raw water production cost for industry and drinking sector.
- Figures estimated through adaptation of water quantities allocation method, that is, 63% of irrigation and 37% of industry and drinking water, are reasonable for both factors mentioned above.

These figures are used to allocate costs of both dams for economic evaluation of irrigation sector.

TABLE I-3-68 COMPREHENSIVE COST ALLOCATION

(Unit : Million baht)

Item	Irrigation			Industry & drinking			Ground Total
	Phase1	Phase2	Phase3	Phase1	Phase2	Phase3	
a. Alternative cost	3,598	4,599	8,197	1,800	1,202	3,002	11,199
b. Justifiable expend value	2,259	3,054	5,349	1,800	1,202	3,002	8,351
c. Smaller either of a. & b.			5,349			3,002	8,351
d. Specific cost	899	1,433	2,332	-	-	-	2,332
e. c-d			3,017			3,002	6,019
f. Specific cost			220			695	915
g. Remaining benefit			2,797			2,307	5,104
h. % of g.			54.8			45.2	100.0
i. Remaining cost allocation			1,493			1,232	2,725
j. Allocated cost (f+i)			1,713			1,927	3,640
k. Ratio allocate %			47.1%			52.9%	100%

I.3.10 Compensation Study

Financial Compensation

A. Compensation for Khlong Si Yat Reservoir

1) Affected villages, households and population to be displaced

According to the socio-agro-economic survey, 1989, the farmers' attitude survey, 1990, and topographical map scaled of 1 : 10,000, the number of the affected villages, households and population to be displaced is 10 villages, 675 household and 3,710 persons. Number of household by village and location of villages are shown by Table I.3. and Figure I.3. Real figures shall be decided through more detailed general survey in the next stage.

2) Analysis of existing land use pattern and land ownership

Aerophoto map is not available. Hence, the existing land use pattern was tentatively analyzed based on topographical map scaled by 1 : 10,000 and the both farmers' surveys mentioned above. Table I.3, shows the used land estimated roughly. The actual figures shall be given through aero photo map and more detailed general survey in the next stage. The settlers have been illegally cultivated in the national forest land without the right of ownership.

3) Land Prices

Land prices to be used for the estimation of land compensation consist of land value and land development cost. (Table I.3.)

The farmers in the Si Yat reservoir have occupied and cultivated their land for a long time ; however, they have not any legal right for land ownership yet. According to the existing regulation and law, the said area will not be entitled to have compensation payment. The land development cost is paid for the land which has already been developed or has a any certificate or evidence of utilization This cost will be payable for the households to be submerged into Si Yat reservoir. This cost is estimated at 1,755 Baht per rai. (Table I.3.)

4) Value of Tree Crops

Value of fruit trees and perennial trees grown on the land which can generate income to their owners shall be compensated. General value of tree crops is estimated based on the results of the farmers' attitude survey, 1990. (Table I.3.)

Real figures shall be decided through more detail general survey.

5) Forest Tree

Forest trees to be submerged belong to the Government. Hence forest land and trees and not financially compensated.

6) Structural Compensation

The number of privately owned structural properties is 675 living houses, 371 storages, 146 Bdgs of livestock housed, and 2 rice wills. As these figures are estimated based on properties of sample in farmers' attitude survey, more detailed general survey is necessary. (Table I.3.)

Public structural properties are two elementary schools, two temples, and one health center. These facilities shall be moved to the resettlement area.

7) Financial compensation Cost

The financial compensation cost is estimated at 139 million baht excluding survey, administration costs and contingency. (Table).

B. Compensation for Diversion Dam Site No.2.

Opportunity to conduct field survey at the diversion dam site has not been obtained yet because of the social conditions. But, the existing land use pattern, number of households, buildings and other properties are can be studied is using aero photo map scaled by 1 : 2,000. According to the information collected from Land Office of Muang Chachoengsao, all farmers to be displaced have title deed.

1) Official land prices in the neighborhood are obtained from Land Office, Muang Chachoengsao District. (Table I.3.)

2) According to the air-photo map scaled 1 : 2,000, the assets related to compensation are estimated as follows.

-	Number of house building		
	Project boundary to 40 m inside	19	buildings
	40m to inside	54	buildings
	Total	73	buildings

- Number of farmhousehold about 30

(It is assumed that one farmhousehold has two or three buildings)

- Land

(1)	Arable land		
	Orchard		
		mango	27.1 ha
		Betle nuts	2.2
		Coconuts	3.5
		Banana	0.5
		Nipa nuts	1.0
		<hr/>	
		Total	34.3
		Paddy filed	2.6
		Water land (Orchard)	2.7
		Garden road site	4.2
		<hr/>	
		Sub-total	43.8
(2)	Fish pond		2.0
(3)	Creek		2.7
(4)	Public road site		0.5
(5)	House site and garden		2.0
		<hr/>	
	Total		51.0 ha

Source : Air-photo map scaled 1 : 2,000.

3) Compensation Cost

Assets of compensation are land with ownership document, tree crops, and structure. The cost excluding administration and contingency are estimated at 80.23 million baht.

Table I.3.69 Number of household submerged in Si Yat Dam Reservoir

Tambon	Village	House submerged under EL. 65 m	Source of date
The Takiab	B. Takian Baen	40	Socio-economic survey, Dec. 1989
	B. Tha Khan	150	ibid
	B. Nok Khao	80	ibid
	B. Tung Lom	70	ibid
	B. Khlon Si	120	ibid(350x0.3)
	(Sub-total)	(460)	
Khlong Takao	B. Khlong Takrao	45	Farmer's Attitudes Survey, May, 1990 and map in scale 1:10,000
	B. Krok Sakae	70	ibid
	B. Khlong Pai	25	ibid
	B. Bueng Rong	50	ibid
	B. Koe Krating	25	Map in scale 1:10,000
	(Sub-total)	(215)	
	Total	675	

Table I.3.70 Land Use in Si Yat Reservoir Area

Land Use	Area:rai (ha)	Contents	unit:rai (ha)
Cultivated Land	25,725(4,116)	Paddy 9,338 to 9,904 (1,494 to 1,585) Upland 14,148 to 15,126 (2,264 to 2,420) Fruit tree 1,261 to 1,693 (202 to 270)	
Forest, fallowing and clearing land	7,786(1,245)	Fallow land 330 to 3,425 (53 to 548) clearing land 0 to 2,322 (0 to 372) Forest land 2,039 to 7,456 (326 to 1,193)	
Village site	65 (11)	House 37, storage 5, livestock house 3, other 20	
Public building site	8 (3)	School 2 palces, health centre 1 place, Temple 2 places	
Road site	53 (9)		21.3 km
River site	103 (16)		33 km
<u>Total</u>	<u>33,750 (5,400)</u>		

(Land Use)

Note 1. Land utilization per farm household is averaged as follows.

Item	Farmer's attitude survey (Average of 60 samples, 1990)		Socio-agro-economic survey (Average of 20 samples, 1989)	
	Rai	%	Rai	%
Cultivated land				
Paddy	20.55	(38.5)	17.22	(36.3)
Upland	29.30	(55.0)	27.83	(58.5)
Fruit trees	3.46	(6.5)	2.28	(4.9)
Sub-total	<u>53.31</u>	(100.0)	<u>47.33</u>	(100.0)
Fallow land	5.08		0.49	
New clearing land	3.44		0.00	
Total farm land	<u>61.83</u>		<u>47.82</u>	

Cultivated land acreage is different by settlement period of sample. A part of fields of farm household settled recently (one year to 10 years or 11 years to 20 years) are located outside the reservoir area.

Cultivated land 25,725 rai inside the reservoir area is estimated considering average area and conditions mentioned above.

Average size of cultivated land is 38.1 rai inside the reservoir area and 44.7 rai totalized on inside and outside. Acreage by paddy, upland and fruit tree are estimated by use of composition of both survey mentioned above.

2. Fallow land and new clearing land was little acreage in the period of Socio-agro-economic survey, 1989. However, those in the period of Farmer's attitude survey, 1990, show large figures. On the other hand, according to the forest mark drawn in the topographical map scaled in 1:10,000, forest acreage is counted at about 2,190 rai (350 ha.) roughly. Hence, forest trees, fallowing land and clearing land are considered as the mixed land use type.

TABLE I-3-71 COMPENSATION COST ITEM

<u>Properties to be Compensated</u>	<u>Detail Properties and Cost Item</u>
Land - Land with Ownership Document	Land Value by Category No.1 to No.5
- Land without Ownership Document	Land development Cost (Land clearing, burning, stump digging, levelling, ploughing, etc.)
Tree - Fruit trees and Perennial trees grown on the crop inundated land (residential area and perennial crop area)	Tree crop inventory in the sample plots
Structure - Houses	Dismantling cost, cost of material loss, Re-building labor cost and Transportation cost
- Other privately - owned structures	
- Public-owned - government	Schools, health centers, weir, bridges, roads, offices etc.
- community	monasteries, water well, etc.

TABLE I-3-72 OFFICIAL RATE OF LAND VALUE

- Tambon Khlong Takrao and Tha Takiab,
Sanam Chaiket District, 1990 -

unit : Baht/rai

<u>Land Category</u>	<u>Land value</u>
1. Closely 80 m rural road	25,000
2. Canal, public road	15,000
3. Other general alnd	10,000

Source: Land Office, Sanam Chaikat District

TABLE I-3-73 OFFICIAL RATE OF LAND VALUE

- Sao Changoh Lub District & Bang Kla District -

unit : Baht/rai

<u>Land Category</u>	<u>Old Price</u>	<u>New Price</u>	<u>Additional Price</u>
1. House site	40,000	100,000	60,000
2. Garden	25,000	100,000	75,000
3. Closely Highway Hua Suan- Sao Changoh			
-Sanam Chang-Sao Changoh 80m	25,000	80,000	55,000
4. Closely canal or Public Utility	12,000	30,000	18,000
5. Out of No.1 to 4	10,000	25,000	15,000

Source: Land Office , Manuary Chachoengsao District, May, 1990.

TABLE I-3-74 OFFICIAL RATE OF LAND VALUE

- Muang Chachoengsao District & Bang Kaw Sud District -

unit: Baht/rai

<u>Land Category</u>	<u>New estimated price recomm- ended</u>	<u>Estimated price (1987 - 1990)</u>
1. Closely 80m Bang Pakong River land	500,000	16,000
2. Closely 40m Salinity Blockade Canal Land	300,000	30,000
3. Lower Salinity Blockade Canal to Bang Pakong River		
3.1 Closely road 40m out of No.1,2	200,000	10,000
3.2 Upper Salinity Blockade Canal to Amphoe Bang Nam Prieo	150,000	7,000
4. Upper Salinity Blockade Canal to Amphoe Bang Nam Prieo		
4.1 Closely road 40 m	150,000	8,000
4.2 Out of No.1-3 & 4-1	100,000	5,000

Source: Land Office, Muang Chachoengsao District, May, 1990.

TABLE I-3-75 ESTIMATION OF FINANCIAL COMPENSATION COST OF FRUIT TREE

<u>Kind of tree</u>	<u>No. of trees</u>	<u>Compensation rate baht/tree</u>	<u>Compensation cost million baht</u>
Mango	11,387	400	4.6
Coconut	9,568	400	3.8
Banana	29,848	10	0.3
Jack Fruit	6,961	200	1.4
Custard Apple	5,799	105	0.6
Tamarind	1,289	200	0.3
Santol	91	300	0.0
Bamboo	660	100	0.1
Lemon	474	150	0.1
Pomelo	483	150	0.1
Tangelin	690	150	0.0
Guava	115	150	0.0
Rose Apple	69	135	0.0
<u>Total</u>	<u>67,434</u>	<u>(170)</u>	<u>11.4</u>
<u>Value escalated to end of 1989:</u>			<u>13.0 (11.4 x 1.138)</u>

Note: Compensation rates are based on the updated Socio-economical study, resettlement plan and environmental impact mitigation plan of KAENG SUA TEN PROJECT, EGAT, 1985.

TABLE I-3-76 ESTIMATION OF NUMBER OF FRUIT TREE

Kind of tree	Krok Sakae Village	Tha Kham Village	Total
Mango	2,978	8,409	11,387
Coconut	1,688	7,880	9,568
Banana	1,774	28,074	29,848
Jack Fruit	774	6,187	6,961
Custard Apple	118	5,681	5,799
Tamarind	355	934	1,289
Santol	22	69	91
Bamboo	269	391	660
Lemon		474	474
Kenok		368	368
Pomelo		483	483
Tangerin		690	690
Guava		115	115

TABLE I-3-77 ESTIMATION OF NUMBER OF FRUIT TREE

- Tha Khan Village -

Kind of Tree	No. of sample having	No. of trees	Average of 40 sample	No. of trees estimated for 460 farmer
Mango	35	731	18.28	8,409
Coconut	34	685	17.13	7,880
Banana	14	2,442	61.03	28,074
Jack Fruit	29	538	13.45	6,187
Lynchee	3	40	1.0	460
Custard Apple	14	494	12.35	5,681
Tamarind	13	81	2.03	934
Star-goose-berry	4	15	0.38	175
Guava	1	10	0.25	115
Lemon	5	41	1.03	474
Kenok	4	32	0.80	368
Santol	3	6	0.15	69
Bamboo	2	34	0.85	391
Sapota	1	5	0.13	60
Pomelo	4	42	1.05	483
Betel nut	1	3	0.08	37
Longan	1	1	0.03	14
Jujube	1	2	0.05	23
Rose Apple	1	6	0.15	69
Tangerin	1	60	1.50	690

Source: Socio-agro Economic Survey, 1989, RID.

TABLE I-3-78 ESTIMATION OF NUMBER AND INCOME OF FRUIT TREE

- Krok Sakae Village -

Kind of tree	No. of sample having	No. of trees	Average of 20 sample	Production		Pro. Value per tree baht	No. of trees estimated for 215 farmer
				value baht	value baht		
Mango	16	277	13.85	11,925	43	2,978	
Cocunut	16	157	7.85	10,700	68	1,688	
Banana	3	165	8.25	25,750	156	1,774	
Jack fruit	13	72	3.60	8,530	118	774	
Custard Apple	2	11	0.55	20	11	118	
Tamarind	7	33	1.65	5,250	11	355	
Santol	1	2	0.10	450	11	22	
Bamboo	2	25	1.25	14,300	11	269	
Rambi	1	3	0.15	900	300	32	
Gandiria	1	4	0.20	---	---	43	

Source: Socio-agro Economic Survey, 1989, RID.

TABLE I-3-79 ESTIMATION OF FINANCIAL COMPENSATION COST FOR PRIVATE BUILDING

- 675 household -

	Type of building						Total
	3	4	5	6	8		
<u>Dwelling house</u>							
No. of building	53	537	43	21	21		
Average site per building (m ²)	156.8	85.1	37.75	35	140		
Average site per m ² (baht)	695	1,089	252	1,286	536		
Average cost per building (1,000 baht)	109	93	10	45	75		
Total Cost (million baht)	5.8	49.9	0.4	0.9	1.6		58.6
<u>Storage</u>							
No. of building	371						
Average site per building (m ²)	21						
Average cost per m ² (baht)	885						
Average cost per building (1,000 baht)	19						
Total Cost (million baht)	7.0						7.0
<u>Livestock house</u>							
No. of building	146						
Average site per building (m ²)	37.2						
Average cost per m ² (baht)	181						
Average cost per building (1,000 baht)	7						
Total Cost (million baht)	1.0						1.0
<u>Rice mill</u>							
	0.1						0.1
Grand total value for private building							66.7

TABLE I-3-80 NUMBER OF BUILDING BY TYPE, BUILDING SITE AND COST

- Socio-agro Economic Survey, 1989, RID -

	Type of Building							
	3	4	5	6	7	8		
<u>Dwelling house</u>								
a. No. of building (sample)	5	51	4	2	—	2		
b. Total site area (m ²)	784	4,340	151	70	—	280		
c. Total cost (baht)	545,000	4,686,000	38,000	90,000	—	150,000		
d. Total year passed	67	571	28	9	—	16		
Average site area (m ²)	156.80	85.10	37.75	35	—	140		
Average cost (baht/m ²)	695	1,089	252	1,286	—	536		
Average year passed	13.4	11.2	7.0	4.5	—	8.0		
<u>Storage</u>								
a. No. of building (sample)	33							
b. Total site area (m ²)	683.25							
c. Total cost (baht)	605,000							
d. Total year passed	369							
Average site area (m ²)	21							
Average cost (baht/m ²)	885							
Average year passed	11.2							
<u>Livestock house</u>								
a. No. of building (sample)	13							
b. Total site area (m ²)	484							
c. Total cost (baht)	87,700							
d. Total year passed	107							
Average site area (m ²)	37.2							
Average cost (baht/m ²)	181							
Average year passed	8.2							

Note: Type of Building

- | | |
|--------------------------------|-------------------------------------|
| 1. two floors, brick house, | 2. two floors, wood and brick house |
| 3. two floors, wood house, | 4. one high floor, wood house |
| 5. one floor, tree leaf, grass | 6. one floor, zinc, ceramic |
| 8. one floor, zinc | 9. temporary house |
| 10. rice mill | 11. rice storage |

Source: Socio-agro Economic Survey, 1989, RID.

TABLE I-3-81 ESTIMATION OF PRIVATE BUILDING SITE

1. Dwelling House		No. of Sample	%	Estimation of building for 675 house	Unit site area	Estimation of Site for 675 house
Type 3		5	7.8	$675 \times 0.078 = 53$	156.8 m^2	$8,310 \text{ m}^2$
Type 4		51	79.7	$675 \times 0.797 = 537$	85.1	45,699
Type 5		4	6.3	$675 \times 0.063 = 43$	37.75	1,623
Type 6		2	3.1	$675 \times 0.031 = 21$	35	735
Type 8		2	3.1	$675 \times 0.031 = 21$	140	2,940
<u>Total</u>		<u>64</u>	<u>100</u>			<u>$59,307 \text{ m}^2 = 37 \text{ rai}$</u>

$59,307 \text{ m}^2 = 5.93 \text{ ha.}$
 $5.93 \text{ ha.} \times 6.25 \text{ rai} = 37 \text{ rai}$

2. Storage	
- Number of storage for 675 house	$675 \times 33/60 \text{ sample} = 371$
- Average site and per one storage	21 m^2
- Total site area	$371 \times 21 \text{ m}^2 = 7,791 \text{ m}^2$ $0.78 \text{ ha} \times 6.25 \text{ rai} = 5 \text{ rai}$

3. Livestock house	
- Number of livestock house for 675 house	$675 \times 13/60 \text{ sample} = 146$
- Average site area per one storage	37.2 m^2
- Total site area	$146 \times 37.2 \text{ m}^2 = 5,431 \text{ m}^2$ $0.54 \text{ ha} \times 6.25 \text{ rai} = 3.4 \text{ rai}$

4. Rice mill

- Number of rice mill ----- $8 \times 15 \times 2 = 240 \text{ m}^2 \approx 0.2 \text{ rai}$

5. Total buildint site

45.6 rai

TABLE I-3-82 PUBLIC BUILDING SITE AND LAND SITE

unit: m²

1. School:

Tha Khan elementary school

Building site : 7.5 m x 50 m = 375

Land site : 10,000

Tha Thkiab elementary school

Building site :

new building No.1 7.5 x 60 m = 450

new building No.2 7.5 x 15 m = 115

Old building 10 x 20 m = 200

Building total 715

Land site : 10,000

2. Health Centre : Building : 12 x 7 = 84

Land site: 300

3. Temple

Tha Khan Building site: Main 484 + 169 = 650
New 18 x 13 = 230
Meeting 8.5 x 7 = 60
Storage 10
Monkhouse 200

Building total 1,150

Land site : 4,000

Tha Thakiab Building site: Meeting 25 x 40 = 1,000
Main 8 x 6 = 50
Sub 7 x 4 = 30

Building total 1,080

Land site : 4,000

4. Total of Land Site 28,300 m² = 18 rai

TABLE I-3-83 FINANCIAL COMPENSATION COST IN SI YAT RESERVOIR

Cost	Item	Compensation	Cost
1. Land:			
	Land with ownership document --	0	
	Land without ownership --		
	Paddy land	9,338 rai	
	Upland	15,126	
	Fruit trees land	1,126	Land development cost
	Fallow land	3,425	33,806 rai x 1,755 B/rai
	Clearing land	2,322	= 59.3 million B
	Residential area	45	
	Forest		Non-compensate because of national forest
2. Tree Crop:			
	Mango, coconut, banana, and others,		
	67,434 trees		<u>13.0 million B</u>
3. Structure:			
	Private buildings 675 house		66.7 million B
	Public structure --		Non-compensate, because of re-construction by
	school, health centre, road,		the re-settlement works
	bridges, electricity		
	Common structure		Non-compensate because of re-construction by
	Monasteries, well		the re-settlement works.
4. Compensation cost excluding administration			139 million Baht
and contingency			

TABLE I-3-84 FINANCIAL COMPENSATION COST IN DIVERSION DAM

Cost	Item	Compensation	Cost
1. Land:			
	Land with ownership document -		
	(Title deed, NS 3KHO)		(million)
	Orchard 257.6 rai	Land category No.1 286.4 rai x 0.1 x 500,000 B =	14.32
	Paddy 16.3 rai	Land category No.3.1 286.4 rai x 0.9 x 200,000 B =	51.55
	Fish pond 12.5 rai	Land category No.4.2 12.5 rai x 100,000 B =	1.25
	Ground & house site 12.5 rai	Sub-total	67.12 million baht
2. Tree Crops:			
	Mango, coconut, betlnut, banana, nipa		3.61 million baht
3. Structure:			
	Public structure - rural road 3.1 rai	Non-compensate because of construction of operation and maintenance road for Diversion Dam.	
	- creek 16.9 rai	Non-compensate because of natural river.	
	Private buildings 73 house	45 house x 180,000 baht =	8.1 million baht
	Dwelling house 45 house	28 house x 50,000 baht =	1.4 million baht
	Storage barn 28 house		<u>9.5 million baht</u>
	Sub-total		
4. Compensation cost excluding administration and contingency			<u>80.23 million baht</u>

**TABLE I-3-85 ESTIMATION OF FINANCIAL COMPENSATION COST
FOR FRUIT TREES IN DIVERSION DAM**

<u>Kind of tree</u>	<u>Area (ha)</u>	<u>No. of tree estimated</u>	<u>Compensation rate, 1985 baht/tree</u>	<u>Compensation cost million Baht</u>
Mango	27.1	6,100	400	2.44
Betelnut	2.2	500	65	0.03
Coconut	3.5	1,400	400	0.56
Banana	0.5	1,250	10	0.01
Nipa	1.0	2,500	50	0.13
Total	34.3	9,750		3.17

Value escalated to end of 1989 $3.17 \times 1.138 = \underline{3.61}$

Note: Compensation rates are based on the updated Socio-economical study, resettlement plan and environmental impact mitigation plan of KAENG SUA TEN PROJECT, EGAT, 1985.

I.3.11 Resettlement Plan for Khlong Si Yat Reservoir

Resettlement Plan for Khlong Si Yat Reservoir

1) Farmer's attitude survey

Attitude of villagers to be removed show high percentage to migrate to resettlement area prepared by the Government.

Attitude of Villagers Concerned

<u>Description</u>	<u>Tambon Takiab</u>	<u>Tambon K.takao</u>	<u>Total (%)</u>
A. Compensation only	5	5	10(16.7)
B. Remove to resettlement area	35	15	50(83.3)
Total	40	20	60

Details of the above item (B)

- Group transfer to resettlement area	8	2	10
- Ditto with land compensation	5	0	5
- Provision of house/infrastructure	1	2	3
- Provision of infrastructure	2	1	3
- Irrigation and infrastructure	3	2	5
- High compensation	1	5	6
- Not classified (others)	15	3	18
Total	35	15	50

Source: Farmers Attitude Survey, June, 1990, RID.

2) Selection of Resettlement Site

There are three considerable resettlement area around the proposed Khlong Si Yat reservoir. The name and location are described as follows:

- 1) No.1 site : Muban Pa Maai, Tambon Khlong Takhao with 24,000 rai of forest land located southeastern part of the dam
- 2) No.2 site : Ditto with 22,000 rai of forest land located southeastern part of the dam
- 3) No.3 site : Ban Thung Hiang, with 6,800 rai of forest land located southeastern part of Rabom dam

No.1 and No.2 sites were inditified by the Royal Forest Department in order to shift these illegal inhabitants from the reserved forest area to the resettlement area. Both projects will be implemented very soon by RFD.

No.3 site was recommended by the Amphoe chief of Sanamchaikhet. Those land in the reserved forest area is being controlled by private company named Suan Kittti, and it is under lawsuit in the court. Availability of such area is not enough to utilize all of them.

General meeting on resettlement site selection was held by RID on 19th, July, 1990. Three sites mentioned above were recognized as non-suitable site to approach by RID.

Suggestion indicated by RID were summarized as follows:

- i. Resettlement site si suitable to look for in the northwest side of Si Yat reservoir and in adjacent Tambon.
- ii. Irrigation water to be supplied to new developed area is sourced from the main irrigation canal runned from dam site or the northern part of reservoir storage.

iii. Hence, the location of site will be proposed in the right bank zone of the main canal (abbreviated to RB zone) and in the hinterland zone (abbreviate to HL zone). (See the Figure)

iv. Reconnaissance survey on the land use was pointly conducted by JICA study team and RID staff.

3) Reconnaissance Survey

On 27, June, 1990, JICA study team and RID staff conducted the reconnaissance survey on both zone mentioned above. The following places are recommendable to carry out more detail survey in order to decide the pilot farm for resettlement farm households:

<u>Place</u>	<u>Note</u>
1. Ban nong Krathing or Ban si Yak - belong to Ban Nong Prue Kra Yang and Ban Toong Yai Chee	Forest lands are still remained on pretty wide area. Grass lands is found. Si Yat village is new village resettled before 8 years.
2. Ban nong Krathing	Topography is hilly in 60 to 70 m A great part of lands are reclaimed. However, land use is very roughly and grass lands are found.

4) Profile of Tambon Tha TaKiab

The administration area in Tambon Tha TaKiab are divided by the following five villages. M001, M003, M005 are related to the subject area on resettlement. In specific, land area in M005 shows a wide acreage in comparison with population.

Social Profile in Tambon Tha TaKiab

<u>Name of village</u>	<u>Family</u>	<u>Population</u>	<u>Land</u>
M001. Ban Wang Wong	265	1,240	22,314 rai (3,570ha)
M002. Ban Tha Kan	378	1,289	63,418 rai (10,147)
M003. Ban Toong Yai Chee	355	1,502	34,425 rai (5,508)
M004. Ban Tha Gloy	412	2,505	50,250 rai (8,040)
M005. Ban Nong Prue Kra Yang	690	2,908	105,843 rai (16,934)
Total	2,100	9,444	276,250 rai (44,200)

Source: Development guideline in agriculture at Tambon Tha Takiab, in accordance with the Project for improving planning system and Development of agriculturists, Office for Promotion of Agriculture of the Eastern Region, Rayong Province.

5) Characteristics of the Soil Suitability

The soil T. Tha Takiab is alluvial land. There are generally range-land. Certain areas are lowland.

Area in M00.1-5 has the characteristics of Soil series No.22

The soil surface is deep with medium irrigation of water. The upper surface is uncondensed soil and the low part is uncondensed soil mixed with clay with slow irrigation. This soil is suitable for growing crops.

For the farmers who plant their crops/fruit orchards within this area, it is considered that suitability for crop growing is very well. There is a trend in planting substitute plant, such as fruit trees.

In addition, M00 1, 2, 4 and 5 belong to Soil Series No.54 which is a slope with ranges of mountains, in general where majority is covered with forest and that the farmers have not started to do agriculture.

M00 3 is Soil Series No.20 which is plain with deep soil surface.

It is uncondensed soil mixed with sand with bad irrigation suitable for planting rice. For those farmers who having planting rice, it is considered very suitable.

In addition, there are 'Bang Kla' series of soil which is similar to 'Satuck' soil (Sattaheep) suitable for growing crops. There is still another series of soil called 'Sakol - Pang Kai', Nong Kork where it is generally a natural forest.

6) Agricultural Development Plan

Preliminary agricultural plan on the resettlement programme is summarized as follows :

- Target farm income will be estimated to ensure that the present economic condition of the evacuees is restored as a minimum requirement.

- Average number of family	: 5.5 person
- Annual averaged family expenditure	: 40,000 Baht
- Net family income (saving)	: 1,000 Baht
- Target farm income	: 41,000 Baht

Data source : Average values of 20 households surveyed in the Khlong Si Yat reservoir area, conducted by Socio-Agro-Economic Survey, 1989.

- Paddy filed to be planted for their self sufficient of rice will be required about 4 rai per household.

- Most suitable cropping plan is decided taking into account soil and local conditions.

- Pumping irrigation system are inevitably required.

- Target farm income 41,000 baht at present will be projected to increase in future.

- In order to protect failure of farmers at the initial stage of the programme, a large sized farm land shall be prepared as much as possible.
- Alternative farm budgets are studied under the following key factors.
 - i. Alternative size of farm are three cases of 10 rai, 15 rai and 20 rai.
 - ii. Cropping pattern is based on Cropping Plan. Cropping intensity in the full development stage is 150 percent. Cropping pattern is shown as follows:

<u>Crop</u>	<u>Wet Season (%)</u>	<u>Dry Season (%)</u>
Paddy	80.9	32.5
Maize	1.6	2.2
Soybean	-	15.9
Groundnuts	-	13.9
Mungbean	-	15.0
Vegetable	0.7	20.5
Mango	16.8	-
Total	100.0	100.0

- iii. Target yields are based on Cropping Plan.

As a results of tentative comparative study, 15 rai and 20 rai can ensure the target farm income at present and in future with growth rate of 30 percent. 20 rai can ensure target farm income with growth rate of 50 percent

7) Scale of Resettlement

Number of household to be removed :

$$675 \times 83.3 \% = 560 \text{ H.H.}$$

Residential area :

$$560 \text{ H.H.} \times 1.0 \text{ rai/H.H.} = 560 \text{ rai}$$

Average farm size :

Approximately 15 rai

Farm land area :

$$560 \text{ H.H.} \times (15 \text{ rai/H.H.}) = 8,400 \text{ rai}$$

Public land for administrative purpose, such as school, temple, government branch offices concerned :

Approximately 250 rai

Land occupied by infrastructural facility :

450 rai

Total area required for resettlement :

Minimum : Approx. 9,660 rai (1,545 ha)

Maximum : Approx. 12,460 rai (1,995 ha)

8) Resettlement Cost

Resettlement cost is estimated at 280 million Baht including contingency.