

H-2. Price Analysis

H-2-1. General

The prices of farm inputs and outputs applied in the farm budget analysis are the current farm-gate prices in view of pursuing the actual cash flow. These are specified as financial prices. On the other hand, the project analysis in terms of the national economy will adopt the economic prices to reflect real values of goods and services from the standpoint of the national economy.

Practically, the farm-gate prices of the tradable goods shall be calculated on the basis of the international market prices of the goods, while those of nontradable goods are derived from the domestic market prices of the goods in taking the same way as in the financial prices. For the Project Area where the labor supply exceeds the demand, the opportunity costs shall be adopted for the wages of the unskilled labors. In this case, the conversion rate of the foreign exchange to Baht should be based on the official rate of US\$ 1.00 to ฿ 23.00. All prices used for these procedures should be at the 1981 constant prices.

H-2-2. Prices of the Farm Products

The tradable goods that will be produced from the Project are paddy and mungbeans. Rice, needless to say, is the major export-oriented product in Thailand, while mungbeans, increasing in its export year by year, marked 178 thousand tons in export in 1979 augmented from 90 thousand tons in 1974 (See Table H-22). The farm-gate price of rices at present and future were based on the World Bank's commodity price projection, whereas those of the other products were based on the annual report "Prices of Agricultural Products" issued by Office of Agricultural Economics, MOAC and the results of field survey conducted in the Project Area.

The present and future economic prices of paddy and mungbeans

were derived in excluding taxes and the rice premium and adjusting domestic costs by applying conversion factors to state all local costs in border price equivalents, and expressed in 1981 constant prices.

The farm-gate prices of agricultural inputs and outputs are summarized in Table H-23. The details are presented in Tables H-24 to H-29.

H-2-3. Economic Cost of Farm Labor

With respect to the labor employed in farming, when the Project is completed, the volume of farm labor used in the Area will be larger, but more manpower will not be used; the existing labor will be used more efficiently. Consequently, nothing will be taken from other sectors of the economy. The daily earnings represented by the additional hours of works needed, would not correspond to the true economic cost in developing the Area where the unemployment rate is high.

Pricing of the economic cost of farm labor was done by applying the method developed by the World Bank, which is based on some hypothesis that a labor wage is decided through a balance between supply and demand of labor under free mobility of labor in rural areas; and it is postulated that the economic cost of farm labor can be approximated by a S-shaped curve against the ratio of demand and supply. The S-shaped curve is drawn by four points; Point A (wage rate of off-farm employment), Point B (average wage rate of farm work), Point C (wage rate of farm work at the busy farming season) and Point D (maximum wage rate). The present and future wage rates at four points are estimated based on the results of farm management survey in the Area and on the assumption that the wage rate would increase annually by 2.5 percent, and are expressed below:

Ratio of demand and supply	Wage rate (₱/day)	
	Present	Future(1990)
A: 0 %	10	13
B: 50 %	20	25
C: 100 %	34	44
D: 150 %	45	56

The correlation between economic costs of farm labor and the ratio of demand to supply is illustrated in Figure H-2.

Table II-22 Paddy Rice and Mungbeans Export of Thailand
(unit: Tons, Million Baht)

Countries	1974	1975	1976	1977	1978	1979
A. Paddy Rice						
1. Indonesia	129,092	11,525	530,178	851,165	170,051	632,178
2. Singapore	86,539	103,568	178,908	220,253	141,365	192,663
3. Malaysia	74,293	18,433	120,443	204,555	160,270	103,718
4. Hongkong	113,994	121,837	125,808	113,635	93,046	109,794
5. Saudi Arabia	73,780	56,507	108,299	26,002	41,407	43,144
6. Philippines	47,214	74,797	55,860	19,377	8	6
7. Others	504,361	564,593	853,895	1,511,447	1,000,585	1,715,366
Total tons	1,029,273	951,260	1,973,391	2,946,434	1,606,732	2,796,869
Total Value	9,778	5,852	8,603	13,382	10,425	15,592
Export price (B/ton)	9,500	6,152	4,359	4,542	6,488	5,575
B. Mungbeans						
1. Japan	27,047	30,278	42,312	39,456	46,041	34,993
2. Taiwan	13,989	16,239	12,321	26,719	30,384	20,503
3. Malaysia	13,281	9,938	3,617	10,726	13,308	12,563
4. Hongkong	12,032	10,726	6,682	7,850	7,882	10,035
5. Others	23,959	16,041	23,146	23,025	62,991	99,460
Total tons	90,308	83,222	88,078	107,776	160,606	177,554
Total Value	454	465	945	1,057	1,160	1,375
Export price (B/ton)	5,027	5,587	10,729	9,807	7,223	7,744

Source: Department of Customs

Table H-23 Farm-gate Prices of Agricultural Inputs and Outputs

(Unit: Baht)

Items	Unit	Present (1981)		Future (1990)	
		Financial	Economic	Financial	Economic
1) Crops					
1. Paddy	ton	3,550	5,065	4,010	6,635
2. Mungbeans	ton	6,525	7,850	6,890	8,835
3. Cucumber	ton	4,930	4,930	5,210	5,210
4. Banana	ton	3,180	3,180	3,360	3,360
2) Seed and Seedling					
1. Paddy	ton	3,550	5,065	4,010	6,635
2. Mungbeans	ton	6,525	7,850	6,890	8,835
3. Cucumber	liter	90	90	95	95
4. Banana	1,000 seedling	500	500	530	530
3) Fertilizer					
1. Nitrogen	kg	20.54	17.41	35.05	30.56
2. Phosphate	kg	15.17	13.31	18.78	16.11
3. Potassium	kg	7.76	6.41	9.66	7.74
4) Animal and Machinery					
1. Cattle	day	75	89	75	89
2. Hand Tractor	day	132	96	165	114
3. Thresher	day	119	94	162	112
5) Fuel					
1. Gasoline	Kilo-liter	11,900	6,880	17,325	9,210
2. Diesel oil	"	7,540	5,440	10,575	7,310

Note: Prices expressed in 1981 constant values.

Table H-24 Price Structure of Paddy

Items	(Unit: Baht/ton)			
	Present (1981)		Future (1990)	
	Financial	Economic	Financial	Economic
Bangkok FOB price, 5% broken				
US\$@ton * 1	510	510	600	600
฿ @ton * 2	11,730	11,730	13,800	13,800
Grade differential * 3	9,015* ⁴	9,015* ⁴	11,870	11,870
Rice premium	600	-	1,505	-
Export duty	355	-	595	-
Municipal tax	15	-	25	-
Exporter's margin * 5	1,295	610	1,815	850
Wholesaler's margin * 5	300	140	440	205
Transport and handling * 6	195	150	290	220
Ex-mill price of rice	6,255	8,115	7,200	10,595
Ex-mill price of paddy	4,190	5,435	4,825	7,100
Milling tax	90	-	115	-
Miller's margin * 7	340	270	410	330
Input price of paddy at mill	3,760	5,165	4,300	6,770
Merchant margin * 5	210	100	290	135
Farm-gate price of paddy	3,550	5,065	4,010	6,635

Note: * 1 ... Prices expressed in 1981 constant values based on current price structure and the World Bank's commodity price projections.

* 2 ... Exchange rate of ฿23 per US\$ 1

* 3 ... Average price of exported white rice excluding parboiled and glutinous rice.

* 4 ... Weighted average price of rice produced in Phetchaburi.

* 5 ... Conversion factor of 0.47

* 6 ... Conversion factor of 0.76

* 7 ... Conversion factor of 0.80

Table H-25 Price Structure of Mungbeans

(Unit: Baht/ton)

Items	Present (1981)		Future (1990)	
	Financial	Economic	Financial	Economic
Bangkok FOB price* ¹	8,815	8,815	10,180	10,180
Export duty and municipal tax	360	-	605	-
Exporters margin* ²				
Wholesalers margin* ² }	1,000	470	1,380	650
Transport and handling* ³	195	150	290	220
Marchant margin* ²	735	345	1,015	475
Farm-gate price	6,525	7,850	6,890	8,835

Note: *¹ ... Prices expressed in 1981 constant values based on current price structure. The forecasted price in 1990 is estimated using annual price increasing rate on the trend of recent three years.

*² ... Conversion factor of 0.47

*³ ... Conversion factor of 0.76

Table II-26 Price Structure of Fertilizer

(Unit: Baht/ton)

Items	1981		1990	
	Financial	Economic	Financial	Economic
A. Ammonium Sulphate				
Bangkok CIF price, US\$@ton*1	128	128	233	233
฿ @ton*2	2,945	2,945	5,360	5,360
Business tax	55	-	75	-
Import duty	-	-	-	-
Importer's margin*3				
Wholesaler's margin*3}	545	255	810	380
Transport and handling*4	195	150	290	220
Marchant margin*3	470	220	650	305
<u>Farm-gate price</u>	<u>4,210</u>	<u>3,570</u>	<u>7,185</u>	<u>6,265</u>
(Element price of Nitrogen ฿@kg*5)	(20.54)	(17.41)	(35.05)	(30.56)
B. Super Phosphate				
Bangkok CIF price, US\$@ton*1	237	237	279	279
฿ @ton*2	5,450	5,450	6,415	6,415
Business tax	85	-	115	-
Import duty	-	-	-	-
Importer's margin*3				
Wholesaler's margin*3}	750	350	1,110	520
Transport and handling*4	195	150	290	220
Marchant margin*3	650	305	895	420
<u>Farm-gate price</u>	<u>7,130</u>	<u>6,255</u>	<u>8,825</u>	<u>7,575</u>
Element price Phosphate ฿@kg*5)	(15.17)	(13.31)	(18.78)	(16.11)
C. Potassium Chloride				
Bangkok CIF price, US\$@ton*1	135	135	155	155
฿ @ton*2	3,105	3,105	3,565	3,565
Business tax	85	-	115	-
Import duty	-	-	-	-
Importer's margin*3				
Wholesaler's margin*3}	680	320	1,010	475
Transport and handling*4	195	150	290	220
Marchant margin*3	590	275	815	385
<u>Farm-gate price</u>	<u>4,655</u>	<u>3,850</u>	<u>5,795</u>	<u>4,645</u>
(Element price Potassium ฿@kg*5)	(7.76)	(6.41)	(9.66)	(7.74)

Note: *1... Prices expressed in 1981 constant dollars founded on current price structure and Price Prospects for Major Primary Commodities, January 1980, World Bank.

*2... Official exchange rate of ฿23 per US\$1

*3... Conversion factor of 0.47

*4... Conversion factor of 0.76

*5... Element farm-gate prices are based on the quantity of element of Ammonium Sulphate (20 - 21% Nitrogen), Super Phosphate (46 - 48% Phosphate) and Potassium Chloride (60% Potassium).

Table H-27 Price Structure of Animal

(Unit: Baht/day)

Items	Present		Future	
	Financial	Economic	Financial	Economic
Purchasing price per head	4,750	4,750	4,750	4,750
Annual fixed cost				
a. Depreciation cost* ¹	792	792	792	792
b. Other fixed cost* ²	380	293	380	293
Total	1,172	1,085	1,172	1,085
Annual fixed cost per day ①* ³	36	33	36	33
Variable cost (feed) per day ②* ⁴	39	56	39	56
Total cost (① + ②)	75	89	75	89

Note: *¹ ... Durable period of 6 years

*² ... Conversion factor of 0.77

*³ ... Annual working days of 33 days per head

*⁴ ... Total Digestible Nutrient (TDN) for cattle (weight 350 kg) is 1,095 kgs per year (TDN 3.0 kgs @day x 365 days = 1,095 kg).

Feed cost is calculated by TDN content of rice bran.

$$\begin{array}{l}
 \left[\begin{array}{l}
 \text{TDN content of rice bran} \dots\dots 79.4\% \\
 \text{Rice bran cost per kgs} \dots\dots 1.5\text{฿} \\
 \text{Annual feed cost per head} \dots\dots 1,300\text{฿}
 \end{array} \right] \\
 \qquad\qquad\qquad (1,095 \div 0.794 \times 1.5 = 1,300)
 \end{array}$$

And, conversion factor of rice 1.43 is applied.

Table II-28 Price Structure of Agri-machinery

(Unit: Baht/day)

Items	Present		Future	
	Financial	Economic	Financial	Economic
<u>A. Diesel Engine (7.5 - 8.5 HP)</u>				
Purchasing price per one unit* ¹	16,000	12,320	16,000	12,320
Annual fixed cost				
a. Depreciation cost* ²	2,000	1,540	2,000	1,540
b. Other fixed cost* ³	1,960	1,235	1,960	1,235
Total	3,960	2,775	3,960	2,775
Annual fixed cost per day (1) * ⁴	34	24	34	24
Variable cost per day				
a. Fuel* ⁵	60	44	85	58
b. Lubricating oil* ⁶	18	13	26	17
Total (2)	78	57	111	75
Total cost (3) = (1) + (2)	<u>112</u>	<u>81</u>	<u>145</u>	<u>99</u>
<u>B. Hand Tractor</u>				
Purchasing price per one unit* ¹	8,500	6,545	8,500	6,545
Annual fixed cost				
a. Depreciation cost* ²	1,700	1,310	1,700	1,310
b. Other fixed cost* ³	680	430	680	430
Total	2,380	1,740	2,380	1,740
Annual fixed cost per day (1) * ⁴	20	15	20	15
Land preparation cost (3) + (4)	<u>132</u>	<u>96</u>	<u>165</u>	<u>114</u>
<u>C. Thresher</u>				
Purchasing price per one unit * ¹	5,000	3,850	5,000	3,850
Annual fixed cost				
a. Depreciation cost * ²	625	481	625	481
b. Other fixed cost * ³	400	308	400	308
Total	1,025	789	1,025	789
Annual fixed cost per day (5) * ⁷	7	13	17	13
Threshing cost (3) + (5)	<u>119</u>	<u>94</u>	<u>162</u>	<u>112</u>

- Note:
- *¹ ... Conversion factor of 0.77
 - *² ... Durable period of 8 years
 - *³ ... Conversion factor of 0.63
 - *⁴ ... Annual working days of 117 days per one unit
 - *⁵ ... 8 liter of diesel oil per day (1ℓ/hr x 8 hr/day)
 - *⁶ ... 30% of fuel cost
 - *⁷ ... Annual working days of 60 days per one unit

Table H-29 Price Structure of Fuel

Unit: Baht/kilo-liter

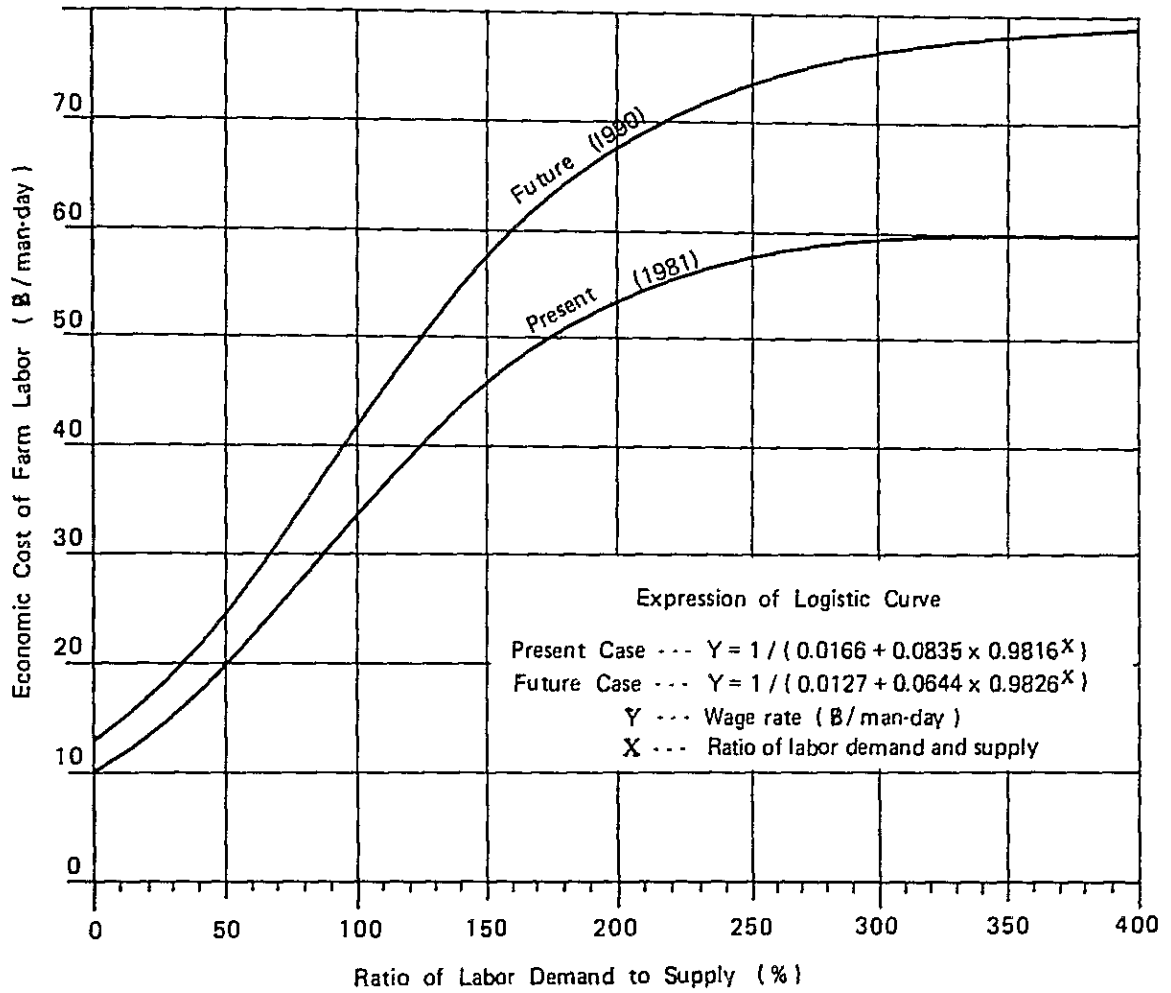
Item	1981		1990	
	Financial	Economic	Financial	Economic
A. Gasolin				
Bangkok CIF price* ¹	5,520	5,520	7,210	7,210
Business tax	385	-	640	-
Import duty	3,175	-	5,320	-
Importer's margin* ²				
Wholesaler's margin* ²	2,320	1,090	3,450	1,620
Transport and handling* ³	120	90	180	135
Merchant margin* ²	380	180	525	245
<u>Farm-gate price</u>	<u>11,900</u>	<u>6,880</u>	<u>17,325</u>	<u>9,210</u>
B. Diesel Oil				
Bangkok CIF price* ¹	4,250	4,250	5,550	5,550
Business tax	255	-	425	-
Import duty	575	-	965	-
Importer's margin* ²				
Wholesaler's margin* ²	2,115	995	3,145	1,480
Transport and handling* ³	120	90	180	135
Merchant margin* ²	225	105	310	145
<u>Farm-gate price</u>	<u>7,540</u>	<u>5,440</u>	<u>10,575</u>	<u>7,310</u>

Note: *¹ ... Prices expressed in 1981 constant dollars founded on current price structure and Price Prospects for Major Primary Commodities, January 1980, World Bank.

*² ... Conversion factor of 0.47

*³ ... Conversion factor of 0.76

Figure H-2 Marginal Opportunity Cost of Farm Labor



H-3. Analysis of Agricultural Benefits

H-3-1. General

The benefits of the project for the national economy are of two kinds: direct benefits and indirect benefits. The direct benefits of the Project are the agricultural benefits based on the values added; they will be estimated as a net increase in value directly imputable to the irrigation development, calculated on the basis of the situation "with" and "without" the project over a certain period.

In addition to the direct benefits, such indirect benefits will accrue as creation of employment opportunity during construction period, encouragement of agri-industries through increase in demands of farm input materials and processing of farm products, etc. These indirect benefits, being intangible and difficult in measuring monetarily, are not taken into estimation of the IERR in most cases.

The net agricultural benefit can be the difference between the net production values with project and those without project, and the net production values can be the difference between the gross production values and the costs. As mentioned in the paragraph H-2-1, the economic prices are adopted in these for the national economy, which the financial prices for the individual farm economy.

The economic analysis has adopted the farm labor cost included in the production costs as the opportunity costs of farm labor derived in the paragraph H-2-3. The availability of farm labor in the Project Area was estimated for two types of labors, full-time labor and part-time labor, in following the procedures as shown below:

Full-time farm labor is defined as those who are specified into the age-group 16 through 64 of age, except for house-keepers.

These full-time workers are presumed to increase in number by

0.7 percent per annum. Women, except for house-keepers, and those who are specified into the age group 10 through 14 and over 65 of age were considered as part-time labor. These part-time workers are presumed to decrease in number by 0.9 percent per annum, and the house-keepers except for women, will increase in number by 0.6 percent per annum.

The forecasted farm labor in the Area is illustrated in Table H-30. Table H-31 shows the monthly-basis farm requirements at the situation of the present, without and with project, which were estimated according to the agricultural development plan, and Table H-38 presents the monthly labor requirements in taking into account the time lag before reaching the full development and staged development of the Project. The estimation of the economic cost of farm labor by using Fig. H-2 resulted in Table H-33. The Project evaluation at farm level has not adopt the family labor into the cost estimate in order to pursue the actual cash flow.

H-3-2. Net Production Value

Table H-34 illustrates the crop budget per hectare at present (1981) and in the future when the Project reaches the full development. The related production costs are shown in Tables H-35 and H-36, respectively. The paddy yield under "Without Project" was estimated to increase by 10 kg/ha for LV and 20 kg/ha for HYV per annum, respectively, according to the record of the paddy yields in the past in the Project Area.

The paddy target yields, which cannot be realized immediately after the completion of irrigation improvement works and on-farm development works, will be accomplished through positive extension services, upgrading of the farming techniques and water management by farmers. The Project consists of two projects, one is the irrigation improvement aiming at rehabilitation of the main irrigation system and construction of additional canals and the other is the on-farm

development project. The construction works of the irrigation improvement project aims first to the on-farm development. The project evaluation has given considerations that the implementation of the irrigation improvement works would enable to accomplish the target incremental yield by 40 percent at the annual rate of 20 percent, while the construction of on-farm facilities would enable to accomplish the remaining 60 percent at the rate of 20 percent for the first two years, 15 percent for the third year and five percent for the fourth year, respectively.

Table H-30 Farm Labor Projections in the Project Area

(Unit: Persons)

Year	Total Farm Laborer	Part Time Labor			Total Farm Labor (man-day)*
		Full Time Labor people between 14 and 65 years old	people between 9 and 15 years old and over 65 years old	House Keepers	
1986	62,800	37,800	15,000	10,000	1,121,100
1987	63,200	38,200	14,900	10,100	1,130,100
1988	63,600	38,500	14,900	10,200	1,138,700
1989	63,900	38,900	14,800	10,200	1,146,900
1990	64,200	39,200	14,700	10,300	1,154,800
1991	64,500	39,500	14,600	10,400	1,162,160
1992	64,700	39,700	14,500	10,500	1,169,200
1993	65,000	40,100	14,500	10,600	1,175,800
1994	65,200	40,400	14,200	10,600	1,182,000
1995	65,300	40,500	14,100	10,700	1,187,800
1996	65,500	40,800	13,900	10,800	1,193,200
1997	65,600	41,000	13,800	10,800	1,198,200
1998	65,800	41,300	13,600	10,900	1,202,700
1999	65,800	41,400	13,500	10,900	1,206,900
2000	65,900	41,600	13,500	11,000	1,210,700
2001	65,900	41,800	13,100	11,000	1,214,100
2002	66,000	42,000	12,900	11,100	1,217,100

Note: * ... based on the monthly working days of 25 for full time labor and 7 for part time labor

Table H-31 Monthly Farm Labor Requirement by Crop

(unit: thousand persons)

Crop	Area (ha)	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1. Paddy Rice, Rainy Season (LV)														
• Present	44,720	44.72	-	-	-	134.16	491.92	804.96	715.52	268.32	178.88	491.92	670.80	3,801.20
• Without Project	44,720	44.72	-	-	-	134.16	491.92	804.96	715.52	268.32	178.88	491.92	670.80	3,801.20
• With Project	14,100	14.10	-	-	-	42.30	141.00	253.80	225.60	84.60	56.40	141.00	211.50	1,170.30
2. Paddy Rice, Rainy Season (HYV)														
• Present	4,950	4.95	-	-	-	4.95	34.65	89.10	89.10	49.50	24.75	69.30	113.85	480.15
• Without Project	4,950	4.95	-	-	-	4.95	34.65	89.10	89.10	49.50	24.75	69.30	113.85	480.15
• With Project	34,600	34.60	-	-	-	34.60	242.20	588.20	622.80	346.00	173.00	415.20	726.60	3,183.20
3. Paddy Rice, Dry Season (HYV)														
• Present	5,820	34.92	122.22	139.68	75.66	75.66	139.68	11.64	-	-	-	-	-	599.46
• Without Project	5,820	34.92	122.22	139.68	75.66	75.66	139.68	11.64	-	-	-	-	-	599.46
• With Project	7,000	77.00	126.00	147.00	147.00	140.00	-	-	-	-	-	-	21.00	658.00
4. Hungbeans														
• Present	2,520	5.04	15.12	5.04	5.04	25.20	93.24	-	-	-	-	-	-	148.68
• Without Project	2,520	5.04	15.12	5.04	5.04	25.20	93.24	-	-	-	-	-	-	148.68
• With Project	7,300	14.60	43.80	14.60	116.80	182.50	36.50	-	-	-	-	-	-	408.80
5. Vegetable (Rainy & Dry Season)														
• Present	3,400	25.50	25.50	51.00	34.00	25.50	51.00	25.50	25.50	40.80	51.00	76.50	51.00	482.80
• Without Project	3,400	25.50	25.50	51.00	34.00	25.50	51.00	25.50	25.50	40.80	51.00	76.50	51.00	482.80
• With Project	3,200	24.00	24.00	48.00	32.00	24.00	48.00	24.00	24.00	38.40	48.00	72.00	48.00	454.40
6. Fruit														
• Present	2,400	14.40	33.60	57.60	36.00	72.00	72.00	72.00	40.80	36.00	28.80	28.80	36.00	528.00
• Without Project	2,400	14.40	33.60	57.60	36.00	72.00	72.00	72.00	40.80	36.00	28.80	28.80	36.00	528.00
• With Project	2,300	13.80	32.20	55.20	34.50	69.00	69.00	69.00	39.10	34.50	27.60	27.60	34.50	506.00
TOTAL														
• Present	63,810	129.53	196.44	253.32	150.70	337.47	882.49	1,003.20	870.92	394.62	283.43	666.52	871.65	6,040.29
• Without Project	63,810	129.53	196.44	253.32	150.70	337.47	882.49	1,003.20	870.92	394.62	283.43	666.52	871.65	6,040.29
• With Project	68,500	178.10	226.00	264.80	330.30	492.40	536.70	935.00	911.50	503.50	305.00	655.80	1,041.60	6,380.70

Table H-32 Total Monthly Farm Labor Requirement with Project (unit: thousand man-day)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
A. With Project													
1986	129.5	196.4	253.3	150.7	803.3	872.5	1,003.2	870.9	394.6	283.4	666.5	871.7	6,496.0
1987	124.7	184.1	238.8	143.5	324.6	854.0	1,000.7	874.2	403.2	285.2	658.7	885.7	7,634.3
1988	116.5	168.8	216.2	134.2	306.9	821.6	995.4	881.1	422.3	288.7	666.1	914.9	5,932.7
1989	120.7	177.9	224.4	137.7	303.4	859.3	988.7	889.3	443.9	293.1	681.4	957.5	6,077.3
1990	128.3	189.9	234.5	156.7	318.1	812.9	981.1	896.8	464.1	297.4	690.9	995.1	6,165.8
1991	124.7	183.8	216.7	168.9	326.2	770.6	970.9	905.1	487.1	301.2	674.9	1,022.2	6,152.3
1992	150.3	233.5	274.5	211.5	376.9	827.0	969.6	905.1	487.1	301.2	697.8	1,038.2	6,472.7
1993	153.3	231.6	272.5	225.3	390.7	790.3	964.3	905.1	487.1	301.3	687.6	1,031.7	6,440.8
1994	154.2	217.9	258.4	237.4	396.1	711.3	955.8	908.7	496.3	303.4	683.8	1,054.3	6,377.6
1995	160.6	222.1	261.4	261.0	419.2	672.1	950.9	911.5	503.5	305.0	682.9	1,055.8	6,406.0
1996	166.7	232.8	271.6	278.8	440.8	747.8	948.6	911.5	503.5	305.0	677.6	-1,052.9	6,537.6
1997	168.9	231.5	270.3	288.9	450.9	732.7	943.7	911.5	503.5	305.0	668.0	1,046.2	6,521.1
1998	173.0	229.1	267.9	307.2	469.3	595.3	935.0	911.5	503.5	305.0	655.8	1,038.5	6,391.1
1999	178.1	226.0	264.8	330.3	492.4	536.7	935.0	911.5	503.5	305.0	655.8	1,041.6	6,380.7
2000	178.1	226.0	264.8	330.3	492.4	536.7	935.0	911.5	503.5	305.0	655.8	1,041.6	6,380.7
2001	178.1	226.0	264.8	330.3	492.4	536.7	935.0	911.5	503.5	305.0	655.8	1,041.6	6,380.7
2002	178.1	226.0	264.8	330.3	492.4	536.7	935.3	911.5	503.5	305.0	655.8	1,041.6	6,380.7

Table II-33 Wage Rate by Month with Project

Year	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
A. Percentage of potential full employment (unit: %)												
1986	12	18	22	13	72	78	89	78	35	25	59	78
1987	11	16	21	13	29	76	89	77	36	25	58	78
1988	10	15	19	12	27	72	87	77	37	25	58	80
1989	11	16	20	12	26	75	86	78	39	26	59	83
1990	11	16	20	14	27	70	85	78	40	26	60	87
1991	11	16	19	15	28	66	84	78	42	26	58	88
1992	13	20	23	18	32	71	83	77	42	26	60	89
1993	13	20	23	19	33	67	82	77	41	26	58	88
1994	13	18	22	20	34	60	81	77	42	26	58	89
1995	14	19	22	22	35	57	80	77	42	26	57	89
1996	14	20	23	23	37	63	80	76	42	25	57	88
1997	14	19	23	24	38	61	79	76	42	25	56	87
1998	14	19	22	26	39	49	78	76	42	25	55	86
1999	15	19	22	27	41	44	77	76	42	25	54	86
2000	15	19	22	27	41	44	77	75	42	25	54	86
2001	15	19	22	27	41	44	77	75	41	25	54	86
2002	15	19	22	27	40	44	77	75	41	25	54	86
B. Wage rate by month (unit: Baht/man-day)												
1986	15.4	16.8	17.7	15.6	32.4	34.4	38.2	34.4	21.0	18.4	28.1	34.4
1987	15.2	16.3	17.5	15.6	19.5	33.7	38.2	34.1	21.3	18.4	27.8	34.4
1988	15.0	16.1	17.0	15.4	18.9	32.4	37.5	34.1	21.6	18.4	27.8	35.1
1989	15.2	16.3	17.2	15.4	18.7	33.4	37.1	34.4	22.1	18.7	28.1	36.1
1990	15.2	16.3	17.2	15.9	18.9	31.7	36.8	34.4	22.4	18.7	28.4	37.5
1991	15.2	16.3	17.0	16.1	19.2	30.4	36.4	34.1	23.0	18.7	27.8	37.8
1992	15.6	17.2	18.0	16.8	20.2	32.0	36.1	34.1	23.0	18.7	28.4	38.2
1993	15.6	17.2	18.0	17.0	20.5	30.7	35.8	34.1	22.7	18.7	27.8	37.8
1994	15.6	16.8	17.7	17.2	20.8	28.4	35.4	34.1	23.0	18.7	27.8	38.2
1995	15.9	17.0	17.7	17.7	21.0	27.5	35.1	33.7	23.0	18.7	27.5	38.2
1996	15.9	17.2	18.0	18.0	21.6	29.4	35.1	33.7	23.0	18.4	27.5	37.8
1997	15.9	17.0	18.0	18.2	21.9	28.8	34.7	33.7	23.0	18.4	27.2	37.5
1998	15.9	17.0	17.7	18.7	22.1	25.0	34.4	33.7	23.0	18.4	26.9	37.1
1999	16.1	17.0	17.7	18.9	22.7	23.6	34.1	33.4	23.0	18.4	26.6	37.1
2000	16.1	17.0	17.7	18.9	22.7	23.6	34.1	33.4	23.0	18.4	26.6	37.1
2001	16.1	17.0	17.7	18.9	22.7	23.6	34.1	33.4	22.7	18.4	26.6	37.1
2002	16.1	17.0	17.7	18.9	22.4	23.6	34.1	33.4	22.7	18.4	26.6	37.1

Table H-34 Net Production Value per Hectare

(Unit: Baht/ha)

Item	1. Paddy Rice LV		2. Paddy Rice HYV		3. Paddy Rice HYV		4. Mungbeans	5. Vegetable	6. Fruit
	Rainy Season	Dry Season	Rainy Season	Dry Season	Dry Season	Dry Season			
1. Present (1981)									
a. Yield	2.17	2.90	2.90	3.00	3.00	0.60	9.00	5.00	
b. Financial Value (tons/ha)									
• Farm-gate Price (฿/ton)	3,550	3,550	3,550	3,550	3,550	6,525	4,950	3,180	
• Gross Production Value	7,704	10,295	10,295	10,650	10,650	3,915	44,370	15,900	
• Production Cost	3,115	4,717	4,717	5,701	5,701	2,375	19,100	7,823	
• Net Production Value	4,589	5,578	5,578	4,949	4,949	1,540	25,270	8,077	
c. Economic Value									
• Farm-gate Price (฿/ton)	5,065	5,065	5,065	5,065	5,065	7,850	4,930	3,180	
• Gross Production Value	10,991	14,689	14,689	15,195	15,195	4,710	44,370	15,900	
• Production Cost	4,810	6,167	6,167	6,710	6,710	3,286	21,776	10,094	
• Net Production Value	6,181	8,522	8,522	8,485	8,485	1,424	22,594	5,806	
2. Without Project									
a. Yield (tons/ha)	2.38	3.32	3.32	3.42	3.42	0.60	9.00	5.00	
b. Financial Value									
• Farm-gate Price (฿/ton)	4,010	4,010	4,010	4,010	4,010	6,890	5,210	3,360	
• Gross Production Value	9,544	13,313	13,313	13,714	13,714	4,134	46,890	16,800	
• Production Cost	3,862	5,845	5,845	7,244	7,244	2,882	24,120	9,941	
• Net Production Value	5,682	7,468	7,468	6,470	6,470	1,252	22,770	6,859	
c. Economic Value									
• Farm-gate Price (฿/ton)	6,635	6,635	6,635	6,635	6,635	8,835	5,210	3,360	
• Gross Production Value	15,791	22,028	22,028	22,692	22,692	5,301	46,890	16,800	
• Production Cost	6,012	8,087	8,087	8,905	8,905	4,033	27,521	12,856	
• Net Production Value	9,779	13,941	13,941	13,787	13,787	1,268	19,369	3,944	
3. With Project									
a. Yield (tons/ha)	3.39	4.59	4.59	4.84	4.84	1.00	15.00	8.00	
b. Financial Value									
• Farm-gate Price (฿/ton)	4,010	4,010	4,010	4,010	4,010	6,890	5,210	3,360	
• Gross Production Value	13,594	18,406	18,406	19,408	19,408	6,890	78,150	26,880	
• Production Cost	5,963	9,011	9,011	11,239	11,239	4,224	12,800	9,680	
• Net Production Value	7,631	9,395	9,395	8,169	8,169	2,666	65,350	17,200	
c. Economic Value									
• Farm-gate Price (฿/ton)	6,635	6,635	6,635	6,635	6,635	8,835	5,210	3,360	
• Gross Production Value	22,493	30,455	30,455	32,113	32,113	8,835	78,150	26,880	
• Production Cost	7,993	11,117	11,117	12,184	12,184	5,210	26,144	12,581	
• Net Production Value	14,500	19,338	19,338	19,929	19,929	3,625	52,006	14,299	

Table H-35 Crop Production Cost per Hectare
- With Project -

(unit: Baht/ha)

Items	Inputs Unit	1. Paddy Rice LV Rainy S.		2. Paddy Rice HYV Rainy S.		3. Paddy Rice HYV Dry S.		4. Mungbeans		5. Vegetable		6. Fruit			
		Vol.*1	Fi.*2	Vol.*3	Fi.*4	Vol.	Fi.	Vol.	Fi.	Vol.	Fi.	Vol.	Fi.		
1. Seeds or Seedling	kg	(60)	241	398	(50)	201	332	(30)	207	265	(4)	380	380	(1,600)	848
2. Fertilizer															
a. Nitrogen	kg	(40)	1,402	1,222	(60)	2,103	1,834	(8)	280	244	(102)	3,575	3,117	(26)	911
b. Phosphate	kg	(40)	751	644	(55)	1,033	886	(10)	188	161	(82)	1,540	1,321	(26)	488
c. Potassium	kg	(-)	-	-	(-)	-	-	(-)	-	-	(134)	1,294	1,037	(42)	406
3. Agro-chemical															
			1,190	1,120		3,150	2,960		1,148	1,079		2,640	2,480		240
4. Machinery															
a. Hand Tractor	days	(7)	1,155	798	(7)	1,155	798	(8)	1,320	912	(6)	990	684	(3)	495
b. Thresher	days	(2)	324	224	(2)	324	224	(-)	-	-	(-)	-	-	(-)	-
5. Labor	days	(14, 83)	616	3,320	(14, 92)	616	3,680	(20, 59)	880	2,360	(142, 284)	6,248	11,360	(123,5,412 220)	8,800
6. Others*2			284	267		429	403		201	189		6,133	5,765		880
Total			5,963	7,993		9,011	11,117		4,224	5,210		22,800	26,144		9,680

Note: *1 ... Input volume, *2 ... Financial cost, *3 ... Economic cost

*4 ... Conversion factor 0.94 is used.

Table H-36 Crop Production Cost per Hectare

- Present -

(unit: Baht/ha)

Items	1. Paddy Rice LY Rainy S.		2. Paddy Rice HYV Rainy S.		3. Paddy Rice HYV Dry S.		4. Mungbeans		5. Vegetable		6. Fruit								
	Unit	Vol.*1	Fi.*2	Eco.*3	Vol.*1	Fi.	Eco.	Vol.	Fi.	Eco.	Vol.	Fi.	Eco.						
1. Seeds or Seedling	kg	(70)	249	354	(60)	213	304	(50)	326	393	liter	seedling	(2,500)	1,250	1,250				
2. Fertilizer																			
a. Nitrogen	kg	(10)	205	174	(32)	657	557	(40)	822	696	(-)	(-)	(96)	1,972	1,671	534	453		
b. Phosphate	kg	(12)	182	160	(40)	607	532	(50)	759	666	(-)	(-)	(120)	1,820	1,597	394	346		
c. Potassium	kg	(-)	-	-	(-)	-	-	(-)	-	-	(-)	(-)	(-)	-	-	(42)	356	269	
3. Agro-chemical			130	120	230	215	215	200	190	190	2,000	1,880							
4. Animal and Machinery																			
a. Animal	days	(6.6)	495	587	(6.6)	495	587	(6.6)	495	587	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
b. Hand Tractor	days	(3.4)	449	326	(3.9)	862	374	(8)	1,056	768	(8)	792	(6)	576	(3)	596	288		
c. Thresher	days	(2)	238	188	(2)	238	188	(2)	238	188	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
5. Labor	days	(26, 85)	884	2,635	(29, 97)	986	3,007	(46, 103)	1,564	3,193	(20, 59)	680	1,829	(142, 284)	4,828	8,804	(23, 220)	4,182	6,820
6. Others *2			283	266		429	403		113	106				7,328	6,888			711	668
Total			3,115	4,810		4,717	6,167		2,375	3,286		19,100	21,776		7,823	10,094			

Note: *1 ... Input volume, *2 ... Financial cost, *3 ... Economic cost

*2 ... Conversion factor 0.94 is used.

H-4. Economic Evaluation

H-4-1. Economic benefits

Table H-37 details the gross agricultural productions under "Without" and "With" Project in taking into consideration the gestation period before reaching the target yield, yield increase during the said period, crop-wise cropping acreages (Appendix C), and implementation period (Appendix G).

The costs of fertilizers, agri-chemicals, farm machineries, farm labor, etc (shown in Table H-38), which compose the farm production costs, shall be evaluated for the economic evaluation of the Project, and the result shall be deducted from the gross production value to obtain the direct benefits of the Project as shown in Table H-40.

H-4-2. Economic Costs

The Project costs can be obtained by adjusting the financial costs that actually incur (Appendix G) into the economic costs from the viewpoint of the national economy as follows:

- Any taxes and duties shall not be included in the economic costs.
- Interests incurred during the construction period shall not be included in the economic costs.
- Contingency for price escalation shall not be included in the economic costs.
- The unskilled labor costs shall be used in opportunity costs.
- The costs for land acquisition in the Project Area shall not be included in the economic costs.
- All the local costs required shall be indicated in the border prices equivalents.

The price escalation shall be excluded by the adjustment as above.

As a result, the investment required by ₪2,216.7 thousand for project construction was evaluated as the economic costs of ₪1,712.5 thousand (Table H-41). The details are shown in Table H-42.

H-4-3. Internal Economic Rate of Return and Sensitivity Analysis

Using the foregoing assumptions and discounting costs and benefits over a 40 years evaluation period of 1981 to 2020, the IERR is 26 per cent as calculated in Table H-43. The sensitivity test for the IERR against the uncertainties inevitable involved in the Project execution was carried out regarding cost over-run, reduction in benefits and delay in reaching full development. The result is shown as follows.

Sensitivity Test
- IERR -

Items	Increase in Project Cost of		
	0 %	10 %	20 %
A. Construction on schedule (15 years)	26.0	24.2	22.6
1. 2-year delay in reaching full development	23.3	21.7	20.3
2. 10 % reduction in paddy yield	23.2	21.5	20.0
3. 10 % reduction in paddy price	23.6	21.9	20.4
4. 10 % increase in farm cost	25.3	23.5	21.9
5. Combination of 1 and 2	20.5	19.1	17.8
6. Combination of 3 and 4	22.9	21.2	19.8
7. Combination of 1,3 and 4	20.3	18.8	17.6
8. Combination of 1,2,3 and 4	15.4	14.0	12.9
B. Three-year extension of construction (18 years)	25.7	23.9	22.3
9. 2-year delay in reaching full development	23.3	21.7	20.2
10. 10 % reduction in paddy yield	22.6	20.9	19.5
11. Combination of 9 and 10	20.5	19.0	17.7
12. Combination of 9,10,3 and 4	12.8	11.8	10.8

Table H-37 Production and Gross Production Value (G P V)
 [unit: Quantity (Qt):::10⁴tons, GPV...10⁶Baht]

Year	Paddy Rice			Mungbeans			Vegetable			Fruit			Total GPV
	LV Rainy S.(Qt)	HVV Rainy S.(Qt)	total Qt	Qt	GPV	Qt	GPV	Qt	GPV	Qt	GPV		
A. With Project													
1986	99.28	14.85	132.17	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,086.01	
1987	94.65	22.57	133.97	1.39	12.28	29.83	155.41	10.86	36.49	10.86	36.49	1,093.07	
1988	83.51	41.11	140.06	1.51	13.34	26.77	139.47	11.14	37.43	11.14	37.43	1,119.54	
1989	71.59	63.25	151.23	2.15	19.00	29.09	151.56	11.64	39.11	11.64	39.11	1,213.08	
1990	60.86	85.20	164.46	3.00	26.51	31.46	163.91	12.03	40.42	12.03	40.42	1,322.03	
1991	47.82	111.45	178.92	3.80	33.57	27.76	144.63	12.76	42.87	12.76	42.87	1,408.20	
1992	49.40	116.43	191.79	5.13	45.32	36.22	188.71	13.73	46.13	13.73	46.13	1,552.69	
1993	50.46	119.67	197.21	5.42	47.89	39.95	208.14	14.11	47.41	14.11	47.41	1,611.93	
1994	46.05	131.61	203.92	5.47	48.33	41.17	214.50	14.52	48.79	14.52	48.79	1,664.63	
1995	43.08	142.26	213.22	5.98	52.83	42.16	219.65	13.20	44.35	13.20	44.35	1,731.54	
1996	44.05	145.78	220.22	6.52	57.60	43.25	225.33	15.23	51.17	15.23	51.17	1,795.26	
1997	45.96	148.78	224.90	6.71	59.28	44.77	233.25	15.81	53.12	15.81	53.12	1,837.86	
1998	46.04	152.34	230.21	6.86	60.61	46.36	241.54	16.25	54.60	16.25	54.60	1,884.19	
1999	46.88	155.24	234.74	7.05	62.29	47.43	247.11	16.50	55.44	16.50	55.44	1,922.34	
2000	47.41	157.13	237.80	7.20	63.61	47.90	249.56	16.56	55.64	16.56	55.64	1,946.61	
2001	47.66	158.12	239.45	7.28	64.32	48.00	250.08	16.56	55.64	16.56	55.64	1,958.79	
2002	47.80	158.82	240.50	7.30	64.50	48.00	250.08	16.56	55.64	16.56	55.64	1,965.94	
B. Without Project													
1986	99.28	14.85	132.17	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,086.01	
1987	99.73	14.95	132.83	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,090.41	
1988	100.17	15.05	133.50	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,094.81	
1989	100.62	15.15	134.16	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,099.21	
1990	101.07	15.25	134.82	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,103.61	
1991	101.51	15.35	135.48	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,108.01	
1992	102.96	15.44	136.15	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,112.41	
1993	102.41	15.54	136.81	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,116.81	
1994	102.86	15.64	137.47	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,121.21	
1995	103.30	15.74	138.13	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,125.61	
1996	103.75	15.84	138.80	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,130.01	
1997	104.20	15.94	139.46	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,134.41	
1998	104.65	16.04	140.12	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,138.81	
1999	105.09	16.14	140.78	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,143.21	
2000	105.54	16.24	141.45	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,147.61	
2001	106.99	16.34	142.11	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,152.01	
2002	106.43	16.43	142.77	1.51	13.34	30.60	159.43	10.80	36.29	10.80	36.29	1,156.41	

Table II-38 Crop Production Cost of Inputs Materials

(unit: thousand Baht)

Year	Seed or Seedling	Fertilizer			Pesticide	Animal, Machinery and Others	Total
		Nitrogen	Phosphate	Potassium			
1986	27,760	35,712	24,088	892	15,092	116,094	219,638
1987	27,004	36,351	24,502	890	14,955	115,018	218,720
1988	25,547	38,184	25,766	882	14,255	112,965	217,599
1989	24,555	44,944	28,035	876	21,496	116,407	236,313
1990	23,756	53,162	33,527	935	32,935	118,885	263,200
1991	22,285	60,693	36,625	1,161	44,917	114,868	280,549
1992	23,468	69,551	40,435	1,603	59,343	123,031	317,431
1993	23,468	75,404	42,926	2,023	73,939	120,419	338,179
1994	22,724	82,929	44,601	2,273	90,094	117,336	359,957
1995	22,497	89,582	46,989	2,530	103,003	116,593	381,194
1996	22,769	94,388	48,405	2,922	113,769	115,848	398,101
1997	22,769	99,798	49,751	3,460	127,138	112,830	415,746
1998	22,769	106,602	51,645	3,860	144,077	110,051	439,004
1999	22,769	109,885	52,436	4,003	151,780	109,712	450,585
2000	22,769	111,302	52,821	4,054	155,208	109,712	455,866
2001	22,769	111,571	52,870	4,054	155,771	109,712	456,747
2002	22,769	111,571	52,870	4,054	155,771	109,712	456,747

Table II-39 Monthly Farm Labor Cost

(unit: thousand Baht)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
A. With Project													
1986	1,994	3,299	4,483	2,350	26,026	30,014	38,322	29,958	8,286	5,214	18,728	29,986	198,667
1987	1,895	3,000	4,179	2,238	6,329	28,779	38,226	29,810	8,588	5,247	18,311	30,468	177,076
1988	1,748	2,717	3,675	2,066	5,800	26,619	37,327	30,045	9,121	5,312	18,517	32,112	175,065
1989	1,834	2,899	3,859	2,120	5,573	28,700	36,680	30,591	9,810	5,480	19,147	34,565	181,366
1990	1,950	3,095	4,033	2,491	6,012	25,768	36,104	30,849	10,395	5,561	19,621	37,316	183,201
1991	1,895	2,995	3,683	2,719	6,263	23,426	35,340	30,863	11,203	5,632	18,762	38,639	181,426
1992	2,344	4,016	4,941	3,553	7,613	26,464	35,002	30,863	11,203	5,632	19,817	39,659	191,111
1993	2,391	3,983	4,905	3,830	8,009	24,262	34,521	30,863	11,057	5,634	19,115	38,998	187,573
1994	2,405	3,660	4,573	4,083	8,238	20,200	33,835	30,986	11,414	5,673	10,009	40,274	184,357
1995	2,553	3,775	4,626	4,619	8,803	18,482	33,376	30,717	11,580	5,703	18,779	40,331	183,351
1996	2,650	4,004	4,888	5,018	9,521	21,985	33,295	30,717	11,580	5,612	18,634	39,799	187,708
1997	2,685	3,935	4,865	5,257	9,874	21,101	32,746	30,717	11,580	5,612	18,169	39,232	185,779
1998	2,750	3,894	4,741	5,744	10,371	14,882	32,164	30,717	11,580	5,612	17,641	38,528	178,629
1999	2,867	3,842	4,686	6,242	11,177	12,666	31,883	30,444	11,580	5,612	17,444	38,643	177,090
2000	2,867	3,842	4,686	6,242	11,177	12,666	31,883	30,444	11,580	5,612	17,444	38,643	177,090
2001	2,867	3,842	4,686	6,242	11,177	12,666	31,883	30,444	11,429	5,612	17,444	38,643	177,090
2002	2,867	3,842	4,686	6,242	11,029	12,666	31,883	30,444	11,429	5,612	17,444	38,643	176,792
B. Without Project													
1986	1,994	3,300	4,483	2,351	26,027	30,014	38,322	29,959	8,287	5,215	18,729	29,986	198,667
1987	1,992	3,294	4,480	2,349	25,927	29,905	38,172	29,850	8,267	5,208	18,679	29,877	198,000
1988	1,991	3,288	4,477	2,347	25,826	29,796	38,021	29,741	8,248	5,201	18,629	29,768	197,332
1989	1,989	3,281	4,474	2,345	25,726	29,687	37,871	29,632	8,228	5,194	18,579	29,659	196,665
1990	1,988	3,275	4,471	2,344	25,625	29,578	37,720	29,524	8,208	5,187	18,529	29,550	195,997
1991	1,986	3,269	4,467	2,342	25,525	29,469	37,570	29,415	8,188	5,179	18,479	29,441	195,330
1992	1,984	3,263	4,464	2,340	25,424	29,360	37,419	29,306	8,169	5,172	18,429	29,332	194,662
1993	1,983	3,257	4,461	2,338	25,324	29,251	37,269	29,197	8,149	5,165	18,379	29,223	193,995
1994	1,981	3,250	4,458	2,336	25,224	29,142	37,118	29,088	8,129	5,158	18,329	29,114	193,327
1995	1,979	3,244	4,455	2,334	25,123	29,032	36,968	28,979	8,109	5,151	18,279	29,006	192,660
1996	1,978	3,238	4,452	2,322	25,023	28,923	36,818	28,870	8,090	5,144	18,229	28,897	191,993
1997	1,976	3,232	4,449	2,320	24,922	28,814	36,667	28,761	8,070	5,137	18,179	28,788	191,325
1998	1,975	3,226	4,446	2,329	24,822	28,705	36,517	28,653	8,050	5,130	18,129	28,679	190,658
1999	1,973	3,220	4,442	2,327	24,721	28,596	36,366	28,544	8,030	5,122	18,079	28,570	189,990
2000	1,971	3,213	4,439	2,325	24,621	28,487	36,216	28,435	8,011	5,115	18,029	28,461	189,323
2001	1,970	3,207	4,436	2,323	24,520	28,378	36,065	28,326	7,991	5,108	17,979	28,352	188,655
2002	1,968	3,201	4,433	2,321	24,420	28,269	35,915	28,217	7,971	5,101	17,929	28,243	187,988

Table H-40 Incremental Production Benefits

(Unit: Million Baht)

Year	Without Project			With Project			Incremental Production Benefits
	Gross Production Value	Production Cost Input Materials	Net Production Value	Gross Production Value	Production Cost Input Materials	Net Production Value	
1986	1,086.01	418.31	667.70	1,086.01	219.64	198.67	0
1987	1,090.41	417.64	672.77	1,093.07	218.72	177.08	24.50
1988	1,094.81	416.98	677.83	1,119.54	217.60	175.07	49.04
1989	1,099.21	416.31	682.90	1,213.08	236.31	181.37	112.50
1990	1,103.61	415.64	687.97	1,322.03	263.20	183.20	187.66
1991	1,108.01	414.97	693.04	1,408.20	280.55	181.43	253.18
1992	1,112.41	414.31	698.10	1,552.69	317.43	191.11	346.05
1993	1,116.81	413.64	703.17	1,611.93	338.18	187.57	383.01
1994	1,121.21	412.97	708.24	1,664.63	359.96	184.36	412.07
1995	1,125.61	412.30	713.31	1,731.54	381.19	183.35	453.69
1996	1,130.01	411.64	718.37	1,795.26	398.10	187.71	491.08
1997	1,134.41	410.97	723.44	1,837.86	415.75	185.78	512.89
1998	1,138.81	410.30	728.51	1,884.19	439.00	178.63	538.05
1999	1,143.21	409.63	733.58	1,922.34	450.59	177.09	561.08
2000	1,147.61	408.97	738.64	1,946.61	455.87	177.09	575.01
2001	1,152.01	408.30	743.71	1,958.79	456.75	177.09	581.24
2002	1,156.34	407.63	748.71	1,965.94	456.75	176.79	583.69

Table H-41 Economic Value of Investment Cost

(unit: Thousand Baht)

Items	Local Currency		Foreign Currency	Total Investment Cost	
	Financial V.	Economic V.		Financial V.	Economic V.
1. Civil Works					
a. Irrigation Improvement Project					
a-1 Rehabilitation	417,909	281,476	170,991	588,900	452,467
a-2 Construction	278,306	187,463	113,794	392,100	301,257
b. On-farm Development Project	315,315	205,672	140,785	456,100	346,457
c. Depreciation cost of machinery	-16,400	-7,708	-189,500	-205,900	-197,208
<u>total</u>	<u>995,130</u>	<u>666,903</u>	<u>236,070</u>	<u>1,231,200</u>	<u>902,973</u>
2. Machinery and Equipment					
a. Construction machinery	32,500	9,916	376,900	409,400	386,816
b. O & M equipment	1,436	435	16,800	18,236	17,235
<u>total</u>	<u>33,936</u>	<u>10,351</u>	<u>393,700</u>	<u>427,636</u>	<u>404,051</u>
3. Project Office	7,300	5,840	3,600	10,900	9,440
4. Land Acquisition	58,300	-	-	58,300	-
5. Consulting Services	30,800	22,792	83,000	113,800	105,792
6. Project Administration	146,900	95,485	26,200	173,100	121,685
<u>Sub-total</u>	<u>1,272,366</u>	<u>801,371</u>	<u>742,570</u>	<u>2,014,936</u>	<u>1,543,941</u>
7. Physical Contingency	127,500	94,350	74,257	201,757	168,607
<u>TOTAL</u>	<u>1,399,866</u>	<u>895,721</u>	<u>816,827</u>	<u>2,216,693</u>	<u>1,712,548</u>

Table H-42 Economic Value of Construction Cost

1. Civil Works

a. Irrigation & Drainage Improvement Project

- Rehabilitation -

(unit: Million Baht)

Items	Local Currency		Foreign Currency	Total	
	Financial	Economic		Fi.	Eco.
A. Import					
1. Cement *1	6.886	3.372	12.854	19.740	16.226
2. Steel *1	6.442	3.959	11.584	18.026	15.543
3. Oil *1	74.846	14.740	68.853	143.699	83.593
4. Depreciation cost *2	6.722	3.149	77.700	84.422	80.849
B. Domestic Procurement					
1. Cement *4	8.569	6.855	-	8.569	6.855
2. Other materials *4	278.525	222.820	-	278.525	222.820
3. Laborer	35.919	26.581	-	35.919	26.581
Total Value	<u>417.909</u>	<u>281.476</u>	<u>170.991</u>	<u>588.900</u>	<u>452.467</u>

Note: *1... Refer to the following table

Items	1. Cement		2. Steel		3. Oil	
	Fi.	Eco.	Fi.	Eco.	Fi.	Eco.
Bangkok CIF Value	12.854	12.854	11.584	11.584	68.853	68.853
Bussiness Tax	0.257	-			4.807	-
Import Duty	1.285	-	0.415	-	39.605	-
Importer & Middleman's Margin *2	2.378	1.118	2.143	1.007	28.932	13.598
Transport & Handling	2.966	2.254	3.884	2.952	1.502	1.142
Value at the Project Site	19.740	16.226	18.026	15.543	143.699	83.593

*2 ... Conversion factor of. 0.47

*3 ... " of. 0.76

*4 ... " of 0.80

- to be continued -

- continued -

b. Irrigation & Drainage Improvement Project					
- Construction - (unit: Million Baht)					
Items	Local Currency		Foreign Currency	Total	
	Financial	Economic		Fi.	Eco.
A. Import					
1. Cement *1	4.585	2.245	8.555	13.140	10.800
2. Steel *1	4.290	2.636	7.711	12.001	10.347
3. Oil *1	49.844	9.816	45.828	95.672	55.644
4. Depreciation cost *2	4.478	2.115	51.700	56.178	53.815
B. Domestic Procurement					
1. Cement *4	5.706	4.565	-	5.706	4.565
2. Other materials *4	185.483	148.386	-	185.483	148.386
3. Laborer	23.920	17.700	-	23.920	17.700
Total Value	<u>278.306</u>	<u>187.463</u>	<u>113.794</u>	<u>392.100</u>	<u>301.257</u>

Note: *1... Refer to the following table

Items	1. Cement		2. Steel		3. Oil	
	Fi.	Eco.	Fi.	Eco.	Fi.	Eco.
Bangkok CIF Value	8.555	8.555	7.711	7.711	45.828	45.828
Business Tax	0.171	-			3.201	-
Import Duty	0.856	-	0.277	-	26.375	-
Importer & Middleman's Margin *2	1.583	0.744	1.427	0.671	19.268	9.056
Transport & Handling *3	1.975	1.501	2.586	1.965	1.000	0.760
Value at the Project Site	13.140	10.800	12.001	10.347	95.672	55.644

*2 ... Conversion factor of 0.47

*3 ... " of 0.76

*4 ... " of 0.80

- to be continued -

- continued -

c. On farm Development Project

Items	(unit: Million Baht)				
	Local Currency		Foreign Currency	Total	
	Financial	Economic		Fi.	Eco.
A. Import					
1. Cement *1	5.115	2.504	9.546	14.661	12.050
2. Steel *1	8.216	5.086	14.882	23.098	19.968
3. Oil *1	61.168	12.046	56.257	117.425	68.303
4. Depreciation cost *2	5.200	2.444	60.100	65.300	62.544
B. Domestic Procurement					
1. Cement *4	6.364	5.091	-	6.364	5.091
2. Other materials	147.578	118.062	-	147.578	118.062
3. Laborer	81.674	60.439	-	81.674	60.439
Total Value	<u>315.315</u>	<u>205.672</u>	<u>140.785</u>	<u>456.100</u>	<u>346.457</u>

Note: *1... Refer to the following table

Items	1. Cement		2. Steel		3. Oil	
	Fi.	Eco.	Fi.	Eco.	Fi.	Eco.
Bangkok CIF Value	9.546	9.546	14.882	14.882	56.257	56.257
Bussiness Tax	0.191	-			3.928	-
Import Duty	0.955	-	0.473	-	32.367	-
Importer & Middleman's Margin *2	1.766	0.830	2.753	1.294	23.645	11.113
Transport & Handling *3	2.203	1.674	4.990	3.792	1.228	0.933
Value at the Project Site	<u>14.661</u>	<u>12.050</u>	<u>23.099</u>	<u>19.968</u>	<u>117.425</u>	<u>68.303</u>

*2 ... Conversion factor of 0.47

*3 ... " of 0.76

*4 ... " of 0.80

- to be continued -

- continued -

2. Machinery and Equipment

(unit: Million Baht)

Items	Machinery		O & M Equipment	
	Financial	Economic	Fi.	Eco.
Bangkok CIF Value	376.900	376.900	16.800	16.800
Bussiness Tax				
Import Duty	16.376	-	0.728	-
Importers Margin *1	8.062	3.789	0.354	0.166
Transport & Handling *2	8.062	6.127	0.354	0.269
Value at the Project Site	409.400	386.816	18.236	17.235

Note: *1 ... Conversion factor of 0.47

*2 ... " of 0.76

3. Other Costs

(unit: Million Baht)

Items		Financial	Economic
3. Project Office	Foreign Currency	3.600	3.600
	Local Currency *1	7.300	5.840
	<u>Total value</u>	<u>10.900</u>	<u>9.440</u>
4. Land acquisition	Local C.	58.300	-
5. Consulting services	Foreign C.	83.000	83.000
	Local C. *2	30.800	22.792
	<u>Total</u>	<u>113.800</u>	<u>105.792</u>
6. Project administration	Foreign C.	26.200	26.200
	Local C. *3	146.900	95.485
	<u>Total</u>	<u>173.100</u>	<u>121.685</u>
7. Contingency	Foreign C.	74.257	74.257
	Local C. *2	127.500	94.350
	<u>Total</u>	<u>201.757</u>	<u>168.607</u>

Note: *1 ... Conversion factor of 0.80

*2 ... " of 0.74

*3 ... " of 0.64

Table H-43 Internal Economic Rate of Return
 (Irrigation Improvement Project and)
 (On-farm Development Project)
 (UNIT : MILLION BAHT)

YEAR	PROJECT COST		TOTAL (1)	INCREMENT- AL BENEFITS (2)	PROJECT RETURN (3) =(2)-(1)	PRESENT WORTH VALUE (3)*DISCOUNT RATE	
	CAPITAL	O & M				[25 %]	[26 %]
1 1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3 1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4 1984	49.20	14.90	64.10	0.00	-64.10	-26.26	-25.43
5 1985	36.00	8.40	44.40	0.00	-44.40	-14.55	-13.98
6 1986	53.50	8.40	61.90	0.00	-61.90	-16.23	-15.47
7 1987	116.50	8.40	124.90	24.50	-100.40	-21.06	-19.91
8 1988	197.40	8.80	206.20	49.00	-157.20	-26.37	-24.75
9 1989	200.70	9.80	210.50	112.50	-98.00	-13.15	-12.24
10 1990	195.00	10.90	205.90	187.70	-18.20	-1.95	-1.80
11 1991	148.60	12.20	160.80	253.20	92.40	7.94	7.27
12 1992	57.80	13.20	71.00	346.10	275.10	18.90	17.18
13 1993	64.20	14.90	79.10	383.00	303.90	16.71	15.06
14 1994	195.40	13.30	208.70	412.10	203.40	8.95	8.00
15 1995	254.80	19.60	274.40	453.70	179.30	6.31	5.60
16 1996	46.30	15.00	61.30	491.10	429.80	12.10	10.65
17 1997	50.40	16.30	66.70	512.90	446.20	10.05	8.77
18 1998	46.80	19.60	66.40	538.10	471.70	8.50	7.36
19 1999	0.00	16.50	16.50	561.10	544.60	7.85	6.75
20 2000	0.00	18.00	18.00	575.00	557.00	6.42	5.48
21 2001	0.00	16.50	16.50	581.20	564.70	5.21	4.41
22 2002	0.00	22.60	22.60	583.70	561.10	4.14	3.47
23 2003	0.00	19.20	19.20	583.70	564.50	3.33	2.77
24 2004	0.00	18.80	18.80	583.70	564.90	2.67	2.20
25 2005	0.00	19.70	19.70	583.70	564.00	2.13	1.75
26 2006	0.00	16.50	16.50	583.70	567.20	1.71	1.39
27 2007	0.00	18.00	18.00	583.70	565.70	1.37	1.10
28 2008	0.00	16.50	16.50	583.70	567.20	1.10	0.88
29 2009	0.00	22.60	22.60	583.70	561.10	0.87	0.69
30 2010	0.00	19.20	19.20	583.70	564.50	0.70	0.55
31 2011	0.00	18.80	18.80	583.70	564.90	0.56	0.44
32 2012	0.00	19.70	19.70	583.70	564.00	0.45	0.35
33 2013	0.00	16.50	16.50	583.70	567.20	0.36	0.28
34 2014	0.00	18.00	18.00	583.70	565.70	0.29	0.22
35 2015	0.00	16.50	16.50	583.70	567.20	0.23	0.17
36 2016	0.00	20.80	20.80	583.70	562.90	0.18	0.14
37 2017	0.00	18.00	18.00	583.70	565.70	0.15	0.11
38 2018	0.00	17.50	17.50	583.70	566.20	0.12	0.09
39 2019	0.00	17.40	17.40	583.70	566.30	0.09	0.07
40 2020	0.00	17.40	17.40	583.70	566.30	0.08	0.05
TOTAL	1712.60	598.40	2311.00	16571.48	14260.46	9.87	-0.34

$$I E R R = 0.25 + 9.87 / (9.87 + 0.34) * 0.01 = 0.2597$$

Table H-44 Internal Economic Rate of Return for Irrigation Improvement Project

(UNIT : MILLION BAHT)

YEAR	PROJECT COST		TOTAL (1)	INCREMENTAL BENEFITS (2)	PROJECT RETURN (3) =(2)-(1)	PRESENT WORTH VALUE (3)*DISCOUNT RATE (26 %) (27 %)	
	CAPITAL	O & M				(26 %)	(27 %)
1 1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3 1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4 1984	33.50	5.70	39.20	0.0	-39.20	-15.55	-15.07
5 1985	20.60	5.70	26.30	0.0	-26.30	-8.28	-7.96
6 1986	41.00	5.70	46.70	0.0	-46.70	-11.67	-11.13
7 1987	105.30	5.70	111.00	24.50	-86.50	-17.16	-16.23
8 1988	163.20	6.10	169.30	49.00	-120.30	-18.94	-17.78
9 1989	151.60	7.10	158.70	106.00	-52.70	-6.58	-6.13
10 1990	136.40	8.20	144.60	166.10	21.50	2.13	1.97
11 1991	94.20	9.30	103.50	207.80	104.30	8.21	7.52
12 1992	0.0	10.20	10.20	271.50	261.30	16.32	14.84
13 1993	1.80	11.60	13.40	276.90	263.50	13.06	11.79
14 1994	152.50	10.20	162.70	273.50	110.80	4.36	3.90
15 1995	223.90	16.20	240.10	289.90	49.80	1.55	1.38
16 1996	0.0	11.50	11.50	491.90	480.40	11.90	10.49
17 1997	0.0	12.90	12.90	295.80	282.90	5.56	4.86
18 1998	0.0	15.90	15.90	289.80	273.90	4.27	3.71
19 1999	0.0	12.80	12.80	284.20	271.40	3.36	2.89
20 2000	0.0	14.30	14.30	281.60	267.30	2.63	2.24
21 2001	0.0	12.80	12.80	283.00	270.20	2.11	1.79
22 2002	0.0	18.90	18.90	284.40	265.50	1.64	1.38
23 2003	0.0	15.50	15.50	286.20	270.70	1.33	1.11
24 2004	0.0	15.10	15.10	286.20	271.10	1.06	0.87
25 2005	0.0	16.00	16.00	286.20	270.20	0.84	0.69
26 2006	0.0	12.80	12.80	286.20	273.40	0.67	0.55
27 2007	0.0	14.30	14.30	286.20	271.90	0.53	0.43
28 2008	0.0	12.80	12.80	286.20	273.40	0.42	0.34
29 2009	0.0	18.90	18.90	286.20	267.30	0.33	0.26
30 2010	0.0	15.50	15.50	286.20	270.70	0.26	0.21
31 2011	0.0	15.10	15.10	286.20	271.10	0.21	0.16
32 2012	0.0	16.00	16.00	286.20	270.20	0.17	0.13
33 2013	0.0	12.80	12.80	286.20	273.40	0.13	0.10
34 2014	0.0	14.30	14.30	286.20	271.90	0.11	0.08
35 2015	0.0	12.80	12.80	286.20	273.40	0.08	0.06
36 2016	0.0	17.10	17.10	286.20	269.10	0.07	0.05
37 2017	0.0	14.30	14.30	286.20	271.90	0.05	0.04
38 2018	0.0	13.80	13.80	286.20	272.40	0.04	0.03
39 2019	0.0	13.70	13.70	286.20	272.50	0.03	0.02
40 2020	0.0	13.70	13.70	286.20	272.50	0.03	0.02
TOTAL	1124.00	465.30	1589.30	9027.50	7438.20	5.29	-0.37

$$I E R R = 0.26 + 5.29 / (5.29 + 0.37) * 0.01 = 0.2693$$

Table H-45 Internal Economic Rate of Return for On-farm Development Project

(UNIT : MILLION BAHT)

YEAR	PROJECT COST			INCREMENTAL BENEFITS (2)	PROJECT RETURN (3) =(2)-(1)	PRESENT WORTH VALUE (3)*DISCOUNT RATE (25 %) (26 %)	
	CAPITAL	O & M	TOTAL (1)			(25 %)	(26 %)
1 1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3 1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4 1984	15.70	9.20	24.90	0.0	-24.90	-10.20	-9.88
5 1985	15.40	2.70	18.10	0.0	-18.10	-5.93	-5.70
6 1986	12.50	2.70	15.20	0.0	-15.20	-3.98	-3.80
7 1987	11.20	2.70	13.90	0.0	-13.90	-2.92	-2.76
8 1988	34.20	2.70	36.90	0.0	-36.90	-6.19	-5.81
9 1989	49.10	2.70	51.80	6.50	-45.30	-6.08	-5.66
10 1990	58.60	2.70	61.30	21.60	-39.70	-4.26	-3.94
11 1991	54.40	2.90	57.30	45.40	-11.90	-1.02	-0.94
12 1992	57.80	3.00	60.80	74.60	13.80	0.95	0.86
13 1993	62.40	3.30	65.70	106.10	40.40	2.22	2.00
14 1994	42.90	3.10	46.00	138.60	92.60	4.07	3.64
15 1995	30.90	3.40	34.30	163.80	129.50	4.56	4.04
16 1996	46.30	3.50	49.80	195.30	145.50	4.10	3.61
17 1997	50.40	3.40	53.80	223.10	169.30	3.81	3.33
18 1998	46.80	3.70	50.50	253.90	203.40	3.66	3.17
19 1999	0.0	3.70	3.70	279.50	275.80	3.97	3.42
20 2000	0.0	3.70	3.70	292.00	288.30	3.32	2.83
21 2001	0.0	3.70	3.70	296.80	293.10	2.70	2.29
22 2002	0.0	3.70	3.70	297.50	293.80	2.17	1.82
23 2003	0.0	3.70	3.70	297.50	293.80	1.73	1.44
24 2004	0.0	3.70	3.70	297.50	293.80	1.39	1.15
25 2005	0.0	3.70	3.70	297.50	293.80	1.11	0.91
26 2006	0.0	3.70	3.70	297.50	293.80	0.89	0.72
27 2007	0.0	3.70	3.70	297.50	293.80	0.71	0.57
28 2008	0.0	3.70	3.70	297.50	293.80	0.57	0.45
29 2009	0.0	3.70	3.70	297.50	293.80	0.45	0.36
30 2010	0.0	3.70	3.70	297.50	293.80	0.36	0.29
31 2011	0.0	3.70	3.70	297.50	293.80	0.29	0.23
32 2012	0.0	3.70	3.70	297.50	293.80	0.23	0.18
33 2013	0.0	3.70	3.70	297.50	293.80	0.19	0.14
34 2014	0.0	3.70	3.70	297.50	293.80	0.15	0.11
35 2015	0.0	3.70	3.70	297.50	293.80	0.12	0.09
36 2016	0.0	3.70	3.70	297.50	293.80	0.10	0.07
37 2017	0.0	3.70	3.70	297.50	293.80	0.08	0.06
38 2018	0.0	3.70	3.70	297.50	293.80	0.06	0.05
39 2019	0.0	3.70	3.70	297.50	293.80	0.05	0.04
40 2020	0.0	3.70	3.70	297.50	293.80	0.04	0.03
TOTAL	588.60	133.10	721.70	7749.70	7028.00	3.47	-0.57

$$I E R R = 0.25 + 3.47 / (3.47 + 0.57) * 0.01 = 0.2586$$

Table H- 46 Beneficial Farm Land With Project

(Unit: ha)					
Items	Year	Paddy Field	Upland Field	Tree Crop Field	Total
A. Beneficial Area of Irrigation Improvement Project					
1. Construction is ready started area					
	1986	-	-	-	-
	1987	3,779	101	145	4,025
	1988	12,503	516	741	13,760
	1989	22,103	768	1,104	23,975
	1990	30,990	930	1,340	33,260
	1991	41,600	1,600	2,300	45,500
	1992	41,600	1,600	2,300	45,500
	1993	41,600	1,600	2,300	45,500
	1994	45,600	1,600	2,300	49,500
	1995-	48,700	1,600	2,300	52,600
2. Construction is non-started area					
	1986	49,670	1,700	2,400	53,770
	1987	45,816	1,593	2,250	49,659
	1988	36,918	1,152	1,627	39,697
	1989	27,127	884	1,248	29,259
	1990	18,063	712	1,002	19,777
	1991	7,241	-	-	7,241
	1992	7,241	-	-	7,241
	1993	7,241	-	-	7,241
	1994	3,162	-	-	3,162
	1995-	-	-	-	-
B. Beneficial Area of On-farm Development Project					
1. Construction is ready started area					
	1988	-	-	-	-
	1989	3,870	78	112	4,060
	1990	8,663	146	212	9,021
	1991	13,248	359	517	14,124
	1992	17,498	666	958	19,122
	1993	23,253	768	1,104	25,125
	1994	29,450	812	1,168	31,430
	1995	32,840	1,006	1,446	35,292
	1996	35,940	1,272	1,828	39,040
	1997	41,600	1,600	2,300	45,500
	1998-	48,700	1,600	2,300	52,600
2. Construction is non-started area					
	1986	-	-	-	-
	1987	3,779	101	145	4,025
	1988	12,503	516	741	13,760
	1989	18,233	690	992	19,915
	1990	22,327	784	1,128	24,239
	1991	28,352	1,241	1,783	31,376
	1992	24,102	934	1,342	26,378
	1993	18,347	832	1,196	20,375
	1994	16,150	788	1,132	18,070
	1995	15,860	594	854	17,308
	1996	12,760	328	472	13,560
	1997	7,100	-	-	7,100
	1998-	-	-	-	-

Table H-47 Cropping Area With Project

(Unit: ha)

Items	Year	Paddy Rice			Mungbeans Dry S.	Upland Crops		Tree Crops	Total
		Rainy S. LV	Rainy S. HYV	Dry S. HYV		Rainy S.	Dry S.		
		A. Beneficial Area of Irrigation Improvement Project							
1. Construction is ready started area	1986	-	-	-	-	-	-	-	-
	1987	1,094	2,685	-	-	101	-	145	4,025
	1988	3,620	8,883	543	566	516	101	741	14,970
	1989	6,399	15,704	1,797	1,874	768	516	1,104	28,162
	1990	8,972	22,018	3,177	3,313	930	768	1,340	40,518
	1991	12,044	29,556	4,454	4,645	1,600	930	2,300	55,529
	1992	12,044	29,556	5,979	6,236	1,600	1,600	2,300	59,315
	1993	12,044	29,556	5,979	6,236	1,600	1,600	2,300	59,315
	1994	13,202	32,398	5,979	6,236	1,600	1,600	2,300	63,315
	1995	14,100	34,600	6,554	6,835	1,600	1,600	2,300	67,589
	1996-	14,100	34,600	7,000	7,300	1,600	1,600	2,300	68,500
2. Construction is non-started area	1986	44,720	4,950	5,820	2,520	1,700	1,700	2,400	63,810
	1987	41,250	4,566	5,368	2,324	1,593	1,593	2,250	58,944
	1988	33,239	3,679	4,326	1,873	1,152	1,152	1,627	47,048
	1989	24,424	2,703	3,179	1,376	884	884	1,248	34,698
	1990	16,263	1,800	2,117	916	712	712	1,002	23,522
	1991	6,519	722	848	367	-	-	-	8,456
	1992	6,519	722	848	367	-	-	-	8,456
	1993	6,519	722	848	367	-	-	-	8,456
	1994	2,847	315	371	160	-	-	-	3,693
	1995	-	-	-	-	-	-	-	-
	1996-	-	-	-	-	-	-	-	-
B. Beneficial Area of On-farm Development Project									
1. Construction is ready started area	1988	-	-	-	-	-	-	-	-
	1989	1,120	2,750	-	-	78	-	112	4,060
	1990	2,508	6,150	556	580	146	78	212	10,230
	1991	3,836	9,412	1,245	1,299	359	146	517	16,814
	1992	5,066	12,432	1,904	1,986	666	359	958	23,371
	1993	6,732	16,521	2,515	2,623	768	666	1,104	30,929
	1994	8,527	20,923	3,342	3,486	812	768	1,168	39,026
	1995	9,508	23,332	4,233	4,414	1,006	812	1,446	44,751
	1996	10,406	25,534	4,720	4,923	1,272	1,006	1,828	49,689
	1997	12,044	29,556	5,166	5,387	1,600	1,272	2,300	57,325
	1998	14,100	34,600	5,979	6,236	1,600	1,600	2,300	66,415
	1999-	14,100	34,600	7,000	7,300	1,600	1,600	2,300	68,500
2. Construction is non-started area	1986	-	-	-	-	-	-	-	-
	1987	1,094	2,685	-	-	101	-	145	4,025
	1988	3,620	8,883	543	566	516	101	741	14,970
	1989	5,279	12,954	1,797	1,874	690	516	992	24,102
	1990	6,464	15,863	2,621	2,733	784	690	1,128	30,233
	1991	8,208	20,144	3,209	3,346	1,241	784	1,783	33,715
	1992	6,978	17,124	4,075	4,250	934	1,241	1,342	35,944
	1993	5,312	13,035	3,464	3,613	532	934	1,198	23,586
	1994	4,675	11,475	2,637	2,750	783	532	1,132	24,289
	1995	4,592	11,268	2,321	2,421	594	783	854	22,833
	1996	3,694	9,066	2,280	2,377	328	594	472	12,811
	1997	2,056	5,044	1,834	1,913	-	328	-	11,175
	1998	-	-	1,021	1,064	-	-	-	2,085
	1999	-	-	-	-	-	-	-	-

H-5. Farm Budget Analysis

H-5-1. Sample Farms

As discussed previously, the second standpoint of the evaluation of the irrigation projects is the so-called financial analysis, which aims at studying the economic feasibility of the projects based on the individual farm economy of the beneficiary farmers. The profitability of irrigation at farm level is related of the actual expenses incurred by the farms and the profits gained when the project is put into effect. The calculation is based on the present state of representative farms in the area, i.e. their structure, mechanization and yields.

The Project Area, adjoining the coastal line by the east and the hilly lands by the west, extends about 74,000 ha with about 40 km long from north to south and about 20 km long from east to west. Such wideness of the Project Area has brought about varieties in the farming sizes, types of farm management, etc. of the beneficiary farmers from one place to another. The financial analysis for the farm management was conducted with typically selected plural farm households in the Area in taking into account their locality, accordingly. The average farming size per farmer in the Area is about 3.1 ha, and more specifically, the farming sizes vary from less than 1.0 ha to 7.0 ha in the related 54 Tambons in the Project Area. Thereby, the farm sizes of the selected model farmers were classified into three by less than 3.0 ha, 3.0 to 4.0 ha and more than 4.0 ha, in taking 3.1 ha as the central figure of the farm sizes in 54 Tambons, and the respective average values were adopted. Such processing has resulted in that the average acreage for 28 Tambons is 2.1 ha (2.14 ha including fallow lands) within a range less than 3.0 ha, that of 12 Tambons is 3.9 ha (4.1 ha) within a range between 3.0 to 4.0 and that of 14 Tambons is 5.4 ha (5.64 ha) within a range more than 4.0 ha. The study on distribution of these three types of farm managements found that the Tambons with average farm size by less than 3.0 ha are located in the western part of the Project Area along the upstream of the main irrigation canal, and those with the average farm size by 3.0 - 4.0 ha and by more than 4.0 ha are located along the mid-and down-stream of the

main irrigation. Almost half of the farm lands operated by the farmers in the Project Area is the tenanted lands. The comparatively larger-size farm lands can be found in the Extension Area.

The following three types of farm managements were selected as representatives in the Project Area in due consideration of the above. Specifically, the relatively small size farms was designated as Model (1) (2.1 ha), the relatively large size of partial tenant farms as Model (2), (about 2.0 ha out of 3.9 ha are tenanted), and the largest size in the Area as Model (3), (located in the Extension Area where the poor conditions in soils and drainage prevail). The present situations of these model farms are explained as follows;

<u>Present Situation of Farm Models</u>			
<u>Item</u>	<u>Farm Model</u>		
	<u>(I)</u>	<u>(II)</u>	<u>(III)</u>
<u>Farm Size (ha)</u>			
Paddy Field	1.90	3.56	5.42
Upland Field	0.09	0.10	-
Orchard	0.11	0.20	-
Fallow Land	0.04	0.25	0.22
<u>Total</u>	<u>2.14</u>	<u>4.11</u>	<u>5.64</u>
<u>Cropping Intensity (%)</u>			
Paddy Field	120	120	100
Upland Field	200	100	-
Orchard	100	100	-
<u>Average</u>	<u>120</u>	<u>111</u>	<u>96</u>
<u>Yield of Paddy (ton/ha)</u>			
Rainy Season, LV	2.31	2.27	1.67
Rainy Season, HYV	2.73	2.60	-
Dry Season, HYV	3.03	2.89	-

H-5-2. Crop Budget

The farm budget analysis, pursuing the actual cash flow of the farms, is made by applying the financial prices. The farm labor, excluding the family labor, is calculated with actual wages of the hired labors. The crop budget per ha, adjusted by financial prices, is shown in Table H-44. These values do not include those project charges of construction costs allocated to farmers and O & M charges that have not been paid by farmers.

H-5-3. Farm Budget

The farm budget analysis made on the selected three farm models is resulted in Table H-45. The relevant estimation includes the project charges obtained on the following presumptions.

Capital Cost Recovery: The beneficiary farmers shall bare 90 percent of the investment capital to on-farm development project. The repayment shall be made for 10 years with annual interest of 12 percent and two-year grace period.

The on-farm development level for farm type (1) and (2) shall be of Type B (¥10,114/ha), while that for farm model (3) be of Type A (¥8,471/ha).

O & M costs: The full amount of costs required for the O & M of both the main irrigation systems and on-farm facilities shall be borne by beneficiary farmers. The estimated annual O & M costs in total are ¥10,740 thousand which can be converted into ¥204/ha.

The farm budget estimated is summarized as follows;

	Farm Model		
	(1) 2.09 ha	(2) 4.02 ha	(3) 5.52 ha
Disposable Income(¥)			
Present	5,030	5,390	5,180
Future	8,890	9,310	11,620

Table H-48 Farm Budgets

Items	Unit	Farm Model (1)* ¹		Farm Model (2)* ¹		Farm Model (3)* ¹	
		Present	Future With Project	Present	Future With Project	Present	Future With Project
1) Operated land	ha	2.14	2.09	4.11	4.02	5.64	5.52
2) Cropping							
a. Paddy rice, Rainy S., LV	ha	1.71	0.54	3.20	1.02	5.42	1.60
b. Paddy Rice, Rainy S., HYV	ha	0.19	1.31	0.36	2.52	-	3.92
c. Paddy Rice, Dry S., HYV	ha	0.28	0.27	0.49	0.51	-	-
d. Mungbeans, Dry S.	ha	0.10	0.28	0.21	0.53	-	-
e. Vegetable, Rainy & Dry S.	ha	0.09x2	0.10x2	0.10	0.10	-	-
f. Fruit	ha	0.11	0.14	0.20	0.23	-	-
Total Cropping area	ha	2.57	2.64	4.56	4.96	5.42	5.52
g. fallow land	ha	0.04	-	0.25	-	0.22	-
Cropping intensity	%	120	131	111	121	96	100
3) Production							
a. Paddy Rice, Rainy S., LV	Tons	3.95	1.88	7.26	3.56	9.05	4.96
b. Paddy Rice, Rainy S., HYV	Tons	0.52	5.93	0.94	11.42	-	15.13
c. Paddy Rice, Dry S., HYV	Tons	0.85	1.29	1.42	2.43	-	-
d. Mungbeans, Dry S.	Tons	0.06	0.28	0.13	0.53	-	-
e. Vegetable, Rainy & Dry S.	Tons	1.62	3.00	0.90	1.50	-	-
f. Fruit	Tons	0.55	1.01	1.00	2.02	-	-
4) Gross Production Value	฿	29,010	57,430	42,620	88,800	32,130	80,560
5) Crop Production Cost	฿	12,670	22,900	18,640	38,220	12,990	38,430
6) Land rent fee	฿	-	-	5,820	12,010	-	-
7) Net Production Value	฿	16,340	34,530	18,160	38,570	19,140	42,130
8) Project Charge							
a. O & M cost* ²	฿	-	430	-	820	-	1,130
b. On-farm cost* ³	฿	-	3,380	-	6,610	-	7,550
Total Project Charge	฿	-	3,810	-	7,430	-	8,680
9) Net Agricultural Income	฿	16,340	30,720	18,160	31,140	19,140	33,450
10) Non-Agricultural Income	฿	8,970	-	7,510	-	6,320	-
11) Farm Income	฿	25,310	30,720	25,670	31,140	25,460	33,450
12) Household Expenditure	฿	20,280	21,830	20,280	21,830	20,280	21,830
13) Disposable Income	฿	5,030	8,890	5,390	9,310	5,180	11,620

Note: *¹ ... Farm Model (1), (2) and (3) farm means Owner farm, Partial tenant farm and Owner farm around the sea dike area, respectively. The half of Farm Model (2) farm's operated land is rented from Owner farmer.

*² ... Annual O & M cost for farm land is 204 Baht per hectare (10,740,000 ฿/52,600 ha = 204 ฿/ha). O & M cost after construction included irrigation main system and on-farm facilities cost but excluded Government personnel expenses of main system.

*³ ... * Farmers repayment condition are (a) 90 percent burden of total cost (b) 2 years of grace period, (c) 10 years repayment period and (d) 12 percent of compound interest per year.

* Land consolidation Type A (8,471฿/ha) applied to Farm Model (3) farms operated land and Type B(10,114฿/ha) applied to Farm Model (1) & (2) farm.

Table H-49 Number of Population, Households and Farm Households by Tambon in the Project Area

(unit : persons, households)

Amphoe and Tambon	Population			Total Households	Farm Households
	Total	Male	Female		
I. Nuang Phetchaburi					
1) Chong Sakae	4,072	1,997	2,075	739	297
2) Dong Yang	4,469	2,147	2,322	781	619
3) Ton Mamuang	1,845	820	1,025	354	220
4) Thong Chai	3,126	1,541	1,585	562	234
5) Na Phan Sam	2,572	1,212	1,360	457	382
6) Na Wung	2,840	1,321	1,519	445	179
7) Bang Chak	1,683	798	885	277	161
8) Bang Chan	3,714	1,733	1,981	647	317
9) Ban Kum	2,570	1,188	1,382	501	288
10) Ban Mo	545	256	289	84	85
11) Ban Pho Phra	1,865	906	959	366	201
12) Pho Rai Wan	1,558	748	810	280	155
13) Rai Som	4,008	1,941	2,067	643	200
14) Wang Tako	468	218	250	88	37
15) Wiang Khoi	1,072	551	521	183	45
16) Sammarong	1,519	742	777	298	188
17) Nong Khanan	4,349	2,266	2,083	752	596
18) Nong Phlap	2,055	956	1,099	369	205
19) Nong Sano	3,026	1,459	1,567	451	180
20) Hua Saphan	1,257	615	642	226	100
21) Hat Chao Samanan	2,496	1,170	1,326	382	287
total	51,109	24,585	26,524	8,885	4,976
II. Cha-am					
1) Cha-am	2,730	1,270	1,460	410	405
2) Kao Yai	4,552	2,116	2,436	684	679
3) Na Yang	3,081	1,623	1,458	496	435
4) Bang kao	2,787	1,342	1,445	449	188
5) Nong Sala	2,576	1,191	1,385	408	336
total	15,726	7,542	8,184	2,447	2,043
III. Kao Yoi					
1) Nong Pla Lai	1,753	933	820	336	195
total	1,753	933	820	336	195
IV. Tha Yang					
1) Tha Yang	15,000	6,993	8,007	2,117	1,246
2) Tha Khoi	8,766	4,116	4,650	1,416	1,090
3) Map Pla Khao	5,312	2,570	2,742	875	717
4) Yang Yong	2,798	1,220	1,578	473	426
5) Nong Chok	6,584	3,205	3,379	1,239	995
total	38,460	18,104	20,356	6,120	4,474
V. Ban Lat					
1) Ban Lat	2,941	1,377	1,564	538	312
2) Tamru	4,782	2,324	2,458	883	779
3) Tha Chang	2,376	1,135	1,241	447	404
4) Tha Sen	2,012	937	1,075	355	319
5) Ban Hat	2,721	1,320	1,401	485	396
6) Rang Kae	1,881	936	945	311	275
7) Rai Makhm	2,315	1,211	1,104	438	313
8) Rai Sathon	3,791	1,811	1,980	639	585
9) Lat Pho	883	427	456	191	149
10) Samo Phlu	1,401	674	727	244	146
11) Saphan Krai	663	309	354	115	89
12) Nong Krachet	2,272	1,039	1,233	386	308
13) Nong Krapu	1,885	925	960	339	314
14) Huai Khong	153	65	88	36	25
total	30,076	14,490	15,586	5,407	4,414
VI. Ban Laem					
1) Ban Laem	3,432	1,706	1,726	268	192
2) Tha Raeng	3,974	1,821	2,153	640	357
3) Tha Raengok	1,797	804	993	292	149
4) Bang Kao	3,017	1,383	1,634	514	281
5) Bang Khun Sai	3,098	1,544	1,554	521	297
6) Bang Khrok	4,481	2,184	2,297	677	429
7) Pak Thale	1,141	586	555	251	54
8) Laem Phak Bai	602	275	327	116	59
total	21,542	10,303	11,239	3,279	1,818
TOTAL	158,666	75,957	82,709	26,474	17,920

Data Source : Data on Village level of Agricultural Census 1978, N.S.O.

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