TABLE E3-20 ANNUAL AVERAGE IRRIGATION AREA IN EACH ALTERNATIVE PLAN
(RESERVOIR CAPACITY: 30.0 MCM)

Alternative Plant	Proposed Cropping Intensity (%)	Reservoir Capacity (MCM)	1st Crop (Dry Season) Irrigation Area Intensity (%)	Time	Area (ha)	2nd Crop (Wet Season) Irrigation Area Intensity (%)	Time	Area (ha)	Annual Average Irrigation Area (ha)
Case III-1	170	30.0	70	28	103,880	100	24	127,200	
						50	1	2,650	
						20	2	2,120	
						10	1	530	
Average				28	3,710		28	4,730	8,440
Case III-2	180	30.0	80	28	118,720	100	23	121,900	
						70	1	3,710	
						45	1	2,385	
						20	1	1,060	
						5	2	530	
Average				28	4,240			4,630	8,870
Case III-3	190	30.0	90	28	133,560	100	23	121,900	
						40	2	4,240	
						20	1	1,060	
						0	2	0	
Average				28	4,770		28	4,540	9,310

TABLE E3-21 ESTIMATION OF CROP BENEFITS FOR ALTERNATIVE PLANS

Alternative Plan	With Project					Without Project	
	1st (Dry Season) Crop		2nd (Wet Season) Crop		Total Net Production Value (1)+(2)=(3)	Net Production Value (4) 3/	Incremental Net Production Value (3)-(4)
	Cropping Area 1/	Net Production Value (1) 2/	Cropping Area 1/	Net Production Value (2) 2/			
	(ha)	(10⁶₱)	(ha)	(10⁶₱)	(10⁶₱)		
Case I-1	3,180	17.3	4,630	33.2	50.5	8.1	42.4
I-2	3,710	20.1	4,630	33.2	53.3	8.1	45.2
I-3	4,240	23.0	4,470	32.1	55.1	8.1	47.0
Case II-1	3,180	17.3	4.670	33.5	50.8	8.1	42.7
II-2	3,710	20.0	4,640	33.3	53.3	8.1	45.2
II-3	4,240	23.0	4,510	32.4	55.4	8.1	47.3
II-4	4.550	24.7	4,510	32.4	57.1	8.1	49.0
II-5	4,980	27.1	4,420	31.7	58.8	8.1	50.7
Case III-1	3,710	20.1	4,730	33.9	54.0	8.1	45.9
III-2	4,240	23.1	4.630	33.2	56.3	8.1	48.2
III-3	4,770	25.9	4,540	32.6	58.5	8.1	50.4

Note; 1/ : See TABLE E3-18 to TABLE E3-20

2/ : See TABLE E3-23

3/ : See TABLE E3-24

TABLE E3-22 INCREMENTAL NET PRODUCTION VALUES (NPV)

(unit: ₱'000)

Alternative Plan	W/Project	W/O Project	Incremental NPV
Case I-1	50,525	8,090	42,435
I-2	53,316	8,090	45,226
I-3	55,149	8,090	47,059
Case II-1	50,812	8,090	42,722
II-2	53,388	8,090	45,298
II-3	55,436	8,090	47,346
II-4	57,111	8,090	49,021
II-5	58,817	8,090	50,727
Case III-1	54,033	8,090	45,943
III-2	56,297	8,090	48,207
III-3	58,535	8,090	50,445

TABLE E3-23 NET PRODUCTION VALUES WITH PROJECT

(unit: ₱'000)

Alternative Plan	Dry Season					Wet Season	Total NPV
	Paddy	Mung-bean	Peanuts	Corn	Vegetable	Paddy	
Case I-1	12,228	1,467	2,013	492	1,100	33,225	50,525
I-2	14,273	1,712	2,249	574	1,283	33,225	53,316
I-3	16,311	1,956	2,684	655	1,466	32,077	55,149
Case II-1	12,228	1,467	2,013	492	1,100	33,512	50.812
II-2	14,273	1,712	2,249	574	1,283	33,297	53,388
II-3	16,311	1,956	2,684	655	1,466	32,364	55,436
II-4	17,502	2,096	2,876	702	1,571	32,364	57,111
II-5	19,153	2,299	3,154	770	1,723	31,718	58,817
Case III-1	14,273	1,712	2,249	574	1,283	33,942	54,033
III-2	16,311	1,956	2,684	655	1,466	33,225	56,297
III-3	18,349	2,201	3,020	737	1,649	32,579	58,535

Note: Cropping areas of each crops are shown in TABLE 3E-25

TABLE E3-24 NET PRODUCTION VALUES WITHOUT PROJECT

Rainfed paddy fields : 1,780 ha

Net Production Values :

Wet Season : 1,602 ha x NPV/ha 2,856 ₱ = $4,575 \times 10^3$ ₱

Dry Season : 1,335 ha x NPV/ha 2,633 ₱ = $3,515 \times 10^3$ ₱

Total = $8,090 \times 10^3$ ₱

TABLE E3-25 CROPPING AREA OF EACH CROP IN CASE OF WITH PROJECT

(Unit: ha)

Alternative Plan	Dry Season						Wet Season
	Paddy	Mung-bean	Peanuts	Corn	Vegetable	Total	Paddy
Case I-1	1,704	210	210	210	210	3,180	4,630
I-2	1,989	245	245	245	245	3,710	4,630
I-3	2,273	280	280	280	280	4,240	4,470
Case II-1	1,704	210	210	210	210	3,180	4,670
II-2	1,989	245	245	245	245	3,710	4,640
II-3	2,273	280	280	280	280	4,240	4,510
II-4	2,439	300	300	300	300	4,550	4,510
II-5	2,669	329	329	329	329	4,980	4,420
Case III-1	1,989	245	245	245	245	3,710	4,730
III-2	2,273	280	280	280	280	4.240	4,630
III-3	2,557	315	315	315	315	4,770	4,540

TABLE E3-26 ESTIMATION OF CONSTRUCTION COST FOR ALTERNATIVE PLANS

Description	Alternative Plans I	II	III
1. Construction Cost (₱'000)			
1.1 Preparation Works	3,700	3,700	3,700
1.2 Dam	130,200	139,200	147,200
1.2.1. Capayas Dam	25,200	25,200	25,200
1.2.2. Bayongan Dam	105,000	114,000	122,000
- Embankment	86,000	94,000	102,000
- Spillway	10,600	10,700	10,900
- Intake Facilities	8,400	9,300	9,100
1.3 Canals	79,700	79,700	79,700
1.4 On-Farm Development	22,400	22,400	22,400
Total	236,000	245,000	253,000
2. Present Value of Construction Cost (₱'000) 1/	195.6	203.1	209.7

1/ : Present values of construction cost are estimaded as follows:

1st year :	Cost (C) x 0.3 x $1/(1+r)^1$ = 0.273·C	(r=10%)
2nd year :	Cost (C) x 0.4 x $1/(1+r)^2$ = 0.331·C	(r=10%)
3rd year :	Cost (C) x 0.3 x $1/(1+r)^3$ = 0.225·C	(r=10%)
Total	0.829·C	

TABLE E3-27 COMPARISON OF PROJECT ECONOMY FOR ALTERNATIVE PLAN OF BAYONGAN DAM

Alternative Plan	Cropping Intensity	Reservoir Capacity	Annual Cropping Area	Benefit: Net Production Value (NPV) 1/	Benefit: Present Value (B)	Cost: Construction Cost 2/	Cost: Present Value (C)	B/C Ratio
	(%)	(MCM)	(ha)	(10⁶₱)	(10⁶₱)	(10⁶₱)	(10⁶₱)	
Case I-1	160	25.0	7,810	42.4	205.9	236.0	195.6	1.05
I-2	170	25.0	8,340	45.2	219.4	236.0	195.6	1.12
I-3	180	25.0	8,710	47.0	228.6	236.0	195.6	1.17
Case II-1	160	27.5	7,850	42.7	207.3	245.0	203.1	1.02
II-2	170	27.5	8,350	45.2	219.9	245.0	203.1	1.08
II-3	180	27.5	8,750	47.3	229.5	245.0	203.1	1.13
II-4	190	27.5	9,060	49.0	237.8	245.0	203.1	1.17
II-5	200	27.5	9,400	50.7	246.1	245.0	203.1	1.21 (max.)
Case III-1	170	30.0	8,440	45.9	222.8	253.0	209.7	1.06
III-2	180	30.0	8,870	48.2	233.9	253.0	209.7	1.12
III-3	190	30.0	9,310	50.4	244.6	253.0	209.7	1.16

Note; 1/ : see Table E3-22
2/ : see Table E3-26

Present values of benefits and costs are discounted with interest of 10 percent at the year of 1989 corresponding to the starting year of construction, as shown belows;

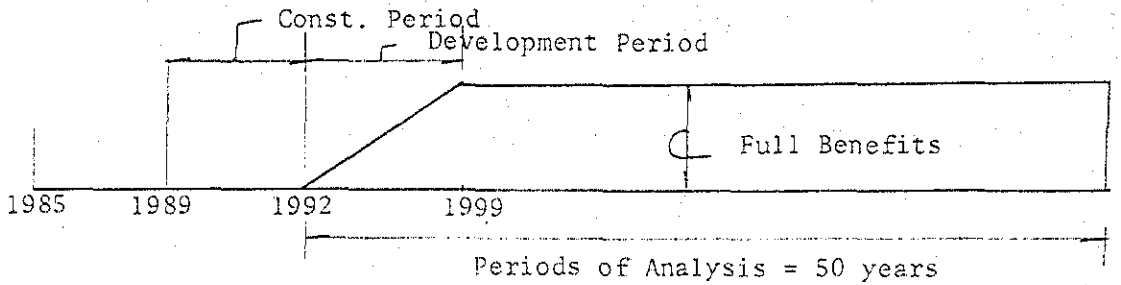
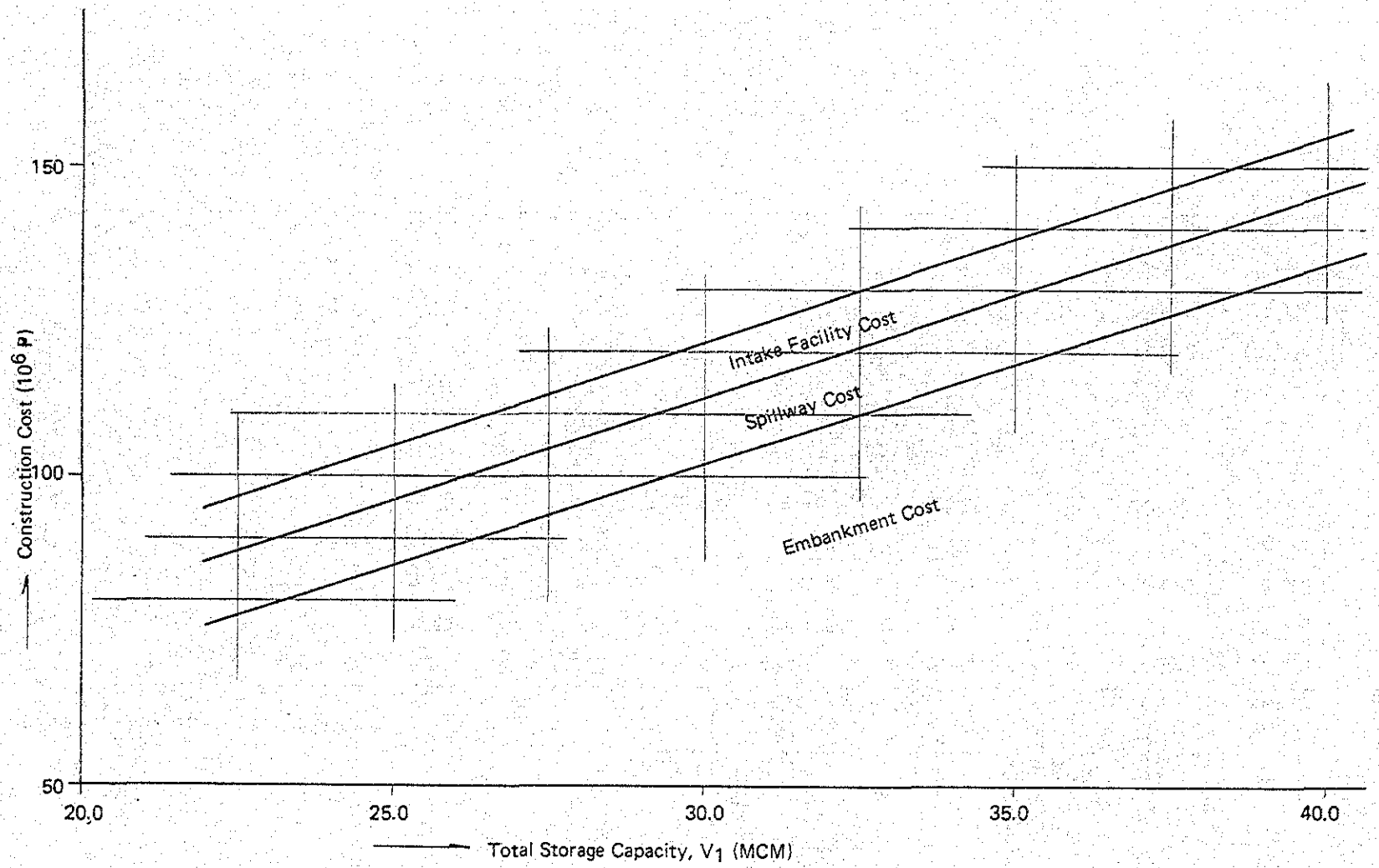


FIGURE E3–3 BAYONGAN DAM STORAGE CAPACITY AND CONSTRUCTION COST CURVE



CHAPTER IV OTHER WATER BALANCE STUDY

4.1 Water Balance Study in Case of Paddy Double Cropping

Water balance studies in case of paddy double cropping were made under the proposed reservoir conditions as shown belows;

- Irrigation Area
  - ° Capayas systems : 1,160 ha
  - ° Bayongan systems : 4,140 ha
  - Total : 5,300 ha

- Reservoir Dimension

	Capayas	Bayongan
° Total storage capacity	2.3 MCM	27.5 MCM
° Effective storage capacity	1.6	22.5

The results of the study are summarized as shown TABLE E4-1, and from the table it is found out that the project makes it possible to supply irrigation water for the area of 5,300 with the cropping intensity of 170 percent, corresponding to the return period of once in five years.

4.2 Water Balance Study with Bayongan Reservoir Only

Two storage reservoirs, Capayas and Bayongan were planned as the irrigation water resources for the Phase II area.

However, additional study of the Bayongan reservoir without the Capayas dam was analyzed for a reference. The reservoir operation study for 28 years was made based on the following criteria;

- Inflow in the reservoir is the runoff from the Bayongan catchment area and surplus water by the Phase I area.

TABLE E4-1 RESULTS OF WATER BALANCE STUDY WITH PADDY DOUBLE CROPPING

Item	Average Water Demand			Average Water Shortage	
	Bayongan System (MCM)	Capayas System (MCM)	Total (MCM)	Volume (MCM)	Time (Year)
Cropping Intensity = 160%					
1967-1968	44.21	12.51	56.72	-17.09	
1972-1973	35.25	10.00	45.25	-5.42	
1980-1981	36.68	10.39	47.07	-6.50	
1982-1983	36.99	10.49	47.48	-10.39	4
Cropping Intensity = 170%					
1958-1959	33.34	9.44	42.78	-1.08	
1967-1968	46.52	13.13	59.65	-20.21	
1968-1969	38.49	10.87	49.36	-2.50	
1972-1973	37.93	10.72	48.65	-7.95	
1980-1981	37.99	10.74	48.73	-6.61	
1982-1983	40.14	11.33	51.47	-13.27	6
Cropping Intensity = 180%					
1957-1958	41.56	11.77	53.33	-2.63	
1958-1959	35.31	10.02	45.33	-3.65	
1965-1966	42.45	12.02	54.47	-1.72	
1967-1968	48.82	13.80	62.62	-22.73	
1968-1969	40.96	11.60	51.56	-5.31	
1972-1973	40.61	11.51	52.12	-10.55	
1980-1981	39.30	11.13	50.43	-6.72	
1982-1983	43.29	12.26	52.55	-16.78	8

Note: Details are presented in TABLE E4-2 to TABLE E4-7.

TABLE E4-2 SUMMARY TABLE OF WATER BALANCE STUDY FOR CAPAYAS DAM WITH PADDY DOUBLE CROPPING

(CROPPING INTENSITY: 160%)

* RESERVOIR CAPACITY 2.34 (MCM)
* MAIN CANAL CAPACITY 2.13 (CU.M/S)

YEAR	INFLOW (MCM)	DEMAND (MCM)	INTAKE (MCM)	DEM TO BAY (MCM)	FR BAY (MCM)	EVAPO (MCM)	SPILLAGE (MCM)	SHORTAGE (MCM)
56-57	14.489	9.286	8.235	-1.051	0.0	0.763	5.682	-1.051
57-58	7.736	10.654	8.087	-2.567	0.0	0.569	0.0	-2.567
58-59	10.577	9.101	9.081	-0.020	0.0	0.745	0.428	-0.020
59-60	10.083	9.141	8.009	-1.133	0.0	0.726	1.650	-1.133
60-61	11.402	8.436	7.407	-1.030	0.0	0.767	3.092	-1.030
61-62	12.873	5.158	5.158	0.0	0.0	0.870	7.035	0.0
62-63	13.584	7.559	6.674	-0.884	0.0	0.768	6.332	-0.884
63-64	10.672	9.718	7.225	-2.493	0.0	0.649	2.989	-2.493
64-65	16.062	8.644	6.418	-2.225	0.0	0.736	9.102	-2.225
65-66	9.631	10.847	8.879	-1.968	0.0	0.565	0.375	-1.968
66-67	11.868	8.889	6.168	-2.721	0.0	0.713	5.265	-2.721
67-68	7.950	12.699	6.995	-5.704	0.0	0.502	0.556	-5.704
68-69	9.181	10.402	7.758	-2.644	0.0	0.555	2.256	-2.644
69-70	9.609	8.798	7.287	-1.511	0.0	0.609	1.264	-1.511
70-71	13.701	7.919	7.919	0.0	0.0	0.791	4.623	0.0
71-72	11.379	8.743	7.338	-1.405	0.0	0.698	3.651	-1.405
72-73	8.585	10.191	6.001	-4.190	0.0	0.496	2.265	-4.190
73-74	12.327	9.367	7.592	-1.775	0.0	0.702	5.255	-1.775
74-75	12.809	7.375	5.384	-1.991	0.0	0.800	5.681	-1.991
75-76	8.881	10.380	8.974	-1.406	0.0	0.657	0.997	-1.406
76-77	12.190	6.493	6.254	-0.240	0.0	0.783	3.843	-0.240
77-78	9.595	8.003	6.895	-1.108	0.0	0.765	2.133	-1.108
78-79	8.438	10.355	7.876	-2.479	0.0	0.577	1.061	-2.479
79-80	16.134	6.995	6.995	0.0	0.0	0.755	7.627	0.0
80-81	10.317	10.585	7.043	-3.542	0.0	0.667	2.798	-3.542
81-82	11.484	9.648	8.626	-1.022	0.0	0.609	2.440	-1.022
82-83	6.534	10.681	5.111	-5.570	0.0	0.416	1.197	-5.570
83-84	9.754	9.082	5.075	-4.007	0.0	0.677	4.457	-4.007
AVE.	10.994	9.112	7.159	-1.953	0.0	0.676	3.359	-1.953

TABLE E4-3 SUMMARY TABLE OF WATER BALANCE STUDY FOR CAPAYAS DAM WITH PADDY DOUBLE CROPPING

(CROPPING INTENSITY: 170%)

* RESERVOIR CAPACITY 2.34 (MCM)
* MAIN CANAL CAPACITY 2.13 (CU.M/S)

YEAR	INFLOW (MCM)	DEMAND (MCM)	INTAKE (MCM)	DEM TO BAY (MCM)	FR BAY (MCM)	EVAPO (MCM)	SPILLAGE (MCM)	SHORTAGE (MCM)
56-57	14.489	9.707	8.656	-1.051	0.0	0.749	5.274	-1.051
57-58	7.736	11.277	8.133	-3.144	0.0	0.523	0.0	-3.144
58-59	10.577	9.627	9.450	-0.177	0.0	0.692	0.112	-0.177
59-60	10.083	9.745	8.606	-1.140	0.0	0.657	1.122	-1.140
60-61	11.402	8.828	7.534	-1.293	0.0	0.735	2.996	-1.293
61-62	12.873	5.491	5.491	0.0	0.0	0.869	6.704	0.0
62-63	13.584	7.953	7.069	-0.884	0.0	0.763	5.943	-0.884
63-64	10.672	10.360	7.270	-3.090	0.0	0.632	2.960	-3.090
64-65	16.062	8.978	6.753	-2.225	0.0	0.731	8.771	-2.225
65-66	9.631	11.497	9.084	-2.413	0.0	0.554	0.181	-2.413
66-67	11.868	9.238	6.517	-2.721	0.0	0.708	4.921	-2.721
67-68	7.950	13.317	7.153	-6.165	0.0	0.476	0.424	-6.165
68-69	9.181	11.064	8.027	-3.037	0.0	0.536	2.006	-3.037
69-70	9.609	9.316	7.621	-1.696	0.0	0.551	0.989	-1.696
70-71	13.701	8.384	8.384	0.0	0.0	0.774	4.175	0.0
71-72	11.379	9.220	7.729	-1.491	0.0	0.660	3.298	-1.491
72-73	8.585	10.907	6.098	-4.810	0.0	0.481	2.183	-4.810
73-74	12.327	9.861	7.853	-2.008	0.0	0.685	5.011	-2.008
74-75	12.809	7.650	5.658	-1.991	0.0	0.798	5.408	-1.991
75-76	8.881	10.894	9.355	-1.540	0.0	0.635	0.638	-1.540
76-77	12.190	6.813	6.449	-0.364	0.0	0.780	3.650	-0.364
77-78	9.595	8.487	7.379	-1.108	0.0	0.720	1.694	-1.108
78-79	8.438	10.997	7.936	-3.061	0.0	0.550	1.028	-3.061
79-80	16.134	7.458	7.458	0.0	0.0	0.730	7.189	0.0
80-81	10.317	10.934	7.280	-3.654	0.0	0.653	2.574	-3.654
81-82	11.484	10.289	8.777	-1.512	0.0	0.591	2.307	-1.512
82-83	6.534	11.524	5.132	-6.392	0.0	0.395	1.197	-6.392
83-84	9.754	9.315	5.308	-4.007	0.0	0.676	4.225	-4.007
AVE.	10.994	9.612	7.434	-2.178	0.0	0.654	3.106	-2.178

TABLE E4-4 SUMMARY TABLE OF WATER BALANCE STUDY FOR CAPAYAS DAM WITH PADDY DOUBLE CROPPING

(CROPPING INTENSITY: 180%)

* RESERVOIR CAPACITY 2.34 (MCM)
* MAIN CANAL CAPACITY 2.13 (CU.M/S)

YEAR	INFLOW (MCM)	DEMAND (MCM)	INTAKE (MCM)	DEM TO BAY (MCM)	FR BAY (MCM)	EVAPO (MCM)	SPILLAGE (MCM)	SHORTAGE (MCM)
56-57	14.489	10.169	9.118	-1.051	0.0	0.730	4.831	-1.051
57-58	7.736	11.960	8.159	-3.802	0.0	0.497	0.0	-3.802
58-59	10.577	10.206	9.485	-0.722	0.0	0.657	0.112	-0.722
59-60	10.083	10.408	8.819	-1.590	0.0	0.621	0.944	-1.590
60-61	11.402	9.260	7.676	-1.584	0.0	0.697	2.892	-1.584
61-62	12.873	5.857	5.857	0.0	0.0	0.866	6.341	0.0
62-63	13.584	8.385	7.501	-0.884	0.0	0.756	5.518	-0.884
63-64	10.672	11.064	7.319	-3.745	0.0	0.618	2.926	-3.745
64-65	16.062	9.344	7.118	-2.225	0.0	0.725	8.412	-2.225
65-66	9.631	12.210	9.154	-3.056	0.0	0.511	0.153	-3.056
66-67	11.868	9.621	6.900	-2.721	0.0	0.702	4.544	-2.721
67-68	7.950	13.995	7.206	-6.789	0.0	0.454	0.393	-6.789
68-69	9.181	11.793	8.318	-3.475	0.0	0.518	1.734	-3.475
69-70	9.609	9.885	7.672	-2.214	0.0	0.501	0.987	-2.214
70-71	13.701	8.896	8.896	0.0	0.0	0.746	3.690	0.0
71-72	11.379	9.744	7.959	-1.785	0.0	0.643	3.084	-1.785
72-73	8.585	11.696	6.191	-5.505	0.0	0.477	2.094	-5.505
73-74	12.327	10.402	8.070	-2.332	0.0	0.679	4.800	-2.332
74-75	12.809	7.952	5.961	-1.991	0.0	0.795	5.108	-1.991
75-76	8.881	11.460	9.536	-1.924	0.0	0.558	0.534	-1.924
76-77	12.190	7.166	6.666	-0.500	0.0	0.777	3.436	-0.500
77-78	9.595	9.019	7.843	-1.176	0.0	0.655	1.296	-1.176
78-79	8.438	11.703	8.004	-3.699	0.0	0.518	0.992	-3.699
79-80	16.134	7.969	7.833	-0.135	0.0	0.690	6.853	-0.135
80-81	10.317	11.321	7.540	-3.781	0.0	0.638	2.329	-3.781
81-82	11.484	10.992	8.949	-2.042	0.0	0.563	2.162	-2.042
82-83	6.534	12.452	5.150	-7.302	0.0	0.377	1.197	-7.302
83-84	9.754	9.573	5.566	-4.007	0.0	0.674	3.969	-4.007
AVE.	10.994	10.161	7.659	-2.501	0.0	0.630	2.905	-2.501

TABLE E4-5 SUMMARY TABLE OF WATER BALANCE STUDY FOR BAYONGAN DAM WITH PADDY DOUBLE CROPPING

(CROPPING INTENSITY: 160%)

* RESERVOIR CAPACITY 27.50 (MCM)
* MAIN CANAL CAPACITY 2.13 (CU.M/S)

UNIT=(MCM)

YEAR	<---- I N F L O W ----> C.AREA	MALINAO	TOTAL	<---- D E M A N D ----> IRRIGAT.	CAPAYAS	TOTAL	INTAKE	EVAPO	LOSS	SHORT	SPILL
56-57	13.675	61.438	75.113	32.043	1.051	33.094	33.094	4.600	0.0	0.0	38.134
57-58	7.021	23.815	30.836	36.909	2.567	39.476	39.476	4.331	0.0	0.0	3.821
58-59	9.814	33.697	43.511	31.374	0.020	31.394	31.394	4.828	0.0	0.0	0.0
59-60	9.366	35.144	44.510	31.511	1.133	32.644	32.644	4.538	0.0	0.0	6.846
60-61	10.569	46.071	56.639	29.013	1.030	30.043	30.043	4.505	0.0	0.0	12.355
61-62	11.978	58.516	70.494	17.317	0.0	17.317	17.317	4.849	0.0	0.0	48.328
62-63	12.777	69.986	82.763	25.878	0.884	26.762	26.762	4.713	0.0	0.0	51.288
63-64	9.867	42.222	52.089	33.567	2.493	36.060	36.060	4.659	0.0	0.0	18.917
64-65	15.346	64.425	79.771	29.754	2.225	31.979	31.979	4.825	0.0	0.0	48.440
65-66	8.856	38.862	47.718	37.595	1.968	39.563	39.563	4.660	0.0	0.0	0.0
66-67	11.144	52.912	64.056	30.630	2.722	33.352	33.352	4.403	0.0	0.0	30.162
67-68	7.339	29.693	37.032	44.209	5.705	49.914	32.828	4.004	0.0	-17.085	0.0
68-69	8.612	26.229	34.841	36.012	2.643	38.655	38.655	4.135	0.0	0.0	0.0
69-70	8.907	41.951	50.858	30.292	1.511	31.803	31.803	4.862	0.0	0.0	0.0
70-71	12.782	73.293	86.075	27.159	0.0	27.159	27.159	4.733	0.0	0.0	47.239
71-72	10.599	59.324	69.923	30.103	1.405	31.508	31.508	4.781	0.0	0.0	35.188
72-73	7.968	35.400	43.368	35.253	4.190	39.443	34.025	3.811	0.0	-5.418	9.408
73-74	11.492	51.358	62.850	32.328	1.775	34.103	34.103	4.658	0.0	0.0	35.332
74-75	12.090	61.803	73.893	25.233	1.992	27.225	27.225	4.724	0.0	0.0	25.863
75-76	8.251	38.916	47.167	35.944	1.407	37.351	37.351	4.607	0.0	0.0	15.705
76-77	11.496	52.280	63.776	22.084	0.240	22.324	22.324	4.629	0.0	0.0	26.570
77-78	9.031	54.757	63.788	27.461	1.108	28.569	28.569	4.869	0.0	0.0	29.510
78-79	7.857	41.962	49.819	35.840	2.480	38.320	38.320	4.832	0.0	0.0	19.105
79-80	15.382	52.996	68.378	23.861	0.0	23.861	23.861	4.565	0.0	0.0	27.513
80-81	9.744	63.825	73.569	36.684	3.542	40.226	33.723	4.509	0.0	-6.503	47.852
81-82	10.864	56.660	67.524	33.319	1.023	34.342	34.342	4.732	0.0	0.0	15.935
82-83	6.118	34.825	40.943	36.990	5.570	42.560	32.167	3.643	0.0	-10.393	5.133
83-84	9.236	69.011	78.247	31.329	4.007	35.336	35.336	4.684	0.0	0.0	45.037
AVE.	10.292	48.977	59.270	31.417	1.953	33.371	31.964	4.560	0.0	-1.407	22.989

TABLE E4-6 SUMMARY TABLE OF WATER BALANCE STUDY FOR BAYONGAN DAM WITH PADDY DOUBLE CROPPING

(CROPPING INTENSITY: 170%)

* RESERVOIR CAPACITY 27.50 (MCM)
* MAIN CANAL CAPACITY 2.13 (CU.M/S)

UNIT=(MCM)

YEAR	<---- INFLOW ----> C.AREA	MALINAO	TOTAL	<---- DEMAND ----> IRRIGAT.	CAPAYAS	TOTAL	INTAKE	EVAPO	LOSS	SHORT	SPILL
56-57	13.675	61.438	75.113	33.616	1.051	34.667	34.667	4.589	0.0	0.0	36.572
57-58	7.021	23.815	30.836	39.235	3.143	42.378	42.378	4.088	0.0	0.0	2.086
58-59	9.814	33.697	43.511	33.341	0.177	33.518	32.436	4.139	0.0	-1.082	0.0
59-60	9.366	35.144	44.510	33.768	1.140	34.908	34.908	4.409	0.0	0.0	3.434
60-61	10.569	46.071	56.639	30.478	1.293	31.771	31.771	4.588	0.0	0.0	10.544
61-62	11.978	58.516	70.494	18.560	0.0	18.560	18.560	4.844	0.0	0.0	47.090
62-63	12.777	69.986	82.763	27.350	0.884	28.234	28.234	4.709	0.0	0.0	49.820
63-64	9.867	42.222	52.089	35.964	3.089	39.053	39.053	4.691	0.0	0.0	15.890
64-65	15.346	64.425	79.771	31.002	2.225	33.227	33.227	4.816	0.0	0.0	47.200
65-66	8.856	38.862	47.718	40.023	2.412	42.435	42.435	4.115	0.0	0.0	0.0
66-67	11.144	52.912	64.056	31.934	2.722	34.656	34.656	4.498	0.0	0.0	26.435
67-68	7.339	29.693	37.032	46.516	6.164	52.680	32.470	4.363	0.0	-20.210	0.0
68-69	8.612	26.229	34.841	38.487	3.038	41.525	39.021	4.317	0.0	-2.504	0.0
69-70	8.907	41.951	50.858	32.229	1.696	33.925	33.925	4.961	0.0	0.0	0.0
70-71	12.782	73.293	86.075	28.898	0.0	28.898	28.898	4.704	0.0	0.0	42.760
71-72	10.599	59.324	69.923	31.884	1.490	33.374	33.374	4.789	0.0	0.0	33.314
72-73	7.968	35.400	43.368	37.930	4.810	42.740	34.794	3.349	0.0	-7.947	9.102
73-74	11.492	51.358	62.850	34.172	2.008	36.180	36.180	4.629	0.0	0.0	33.284
74-75	12.090	61.803	73.893	26.259	1.992	28.251	28.251	4.718	0.0	0.0	24.842
75-76	8.251	38.916	47.167	37.866	1.540	39.406	39.406	4.583	0.0	0.0	13.798
76-77	11.496	52.280	63.776	23.280	0.364	23.644	23.644	4.596	0.0	0.0	25.160
77-78	9.031	54.757	63.788	29.268	1.108	30.376	30.376	4.858	0.0	0.0	27.714
78-79	7.857	41.962	49.819	38.239	3.061	41.300	41.300	4.778	0.0	0.0	16.179
79-80	15.382	52.996	68.378	25.594	0.0	25.594	25.594	4.485	0.0	0.0	25.860
80-81	9.744	63.825	73.569	37.992	3.654	41.646	35.040	4.489	0.0	-6.606	46.555
81-82	10.864	56.660	67.524	35.712	1.513	37.225	37.225	4.690	0.0	0.0	13.094
82-83	6.118	34.825	40.943	40.142	6.393	46.535	33.316	2.900	0.0	-13.267	4.775
83-84	9.236	69.011	78.247	32.202	4.007	36.209	36.209	4.683	0.0	0.0	44.165
AVE.	10.292	48.977	59.270	33.283	2.178	35.461	33.619	4.478	0.0	-1.843	21.417

TABLE E4-7 SUMMARY TABLE OF WATER BALANCE STUDY FOR BAYONGAN DAM WITH PADDY DOUBLE CROPPING

(CROPPING INTENSITY: 180%)

* RESERVOIR CAPACITY 27.50 (MCM)
* MAIN CANAL CAPACITY 2.13 (CU.M/S)

UNIT=(MCM)

YEAR	<---- I N F L O W ----> C.AREA	MALINAO	TOTAL	<---- D E M A N D ----> IRRIGAT.	CAPAYAS	TOTAL	INTAKE	EVAPO	LOSS	SHORT	SPILL
56-57	13.675	61.438	75.113	35.189	1.051	36.240	36.240	4.566	0.0	0.0	35.021
57-58	7.021	23.815	30.836	41.561	3.802	45.363	42.729	4.255	0.0	-2.633	1.866
58-59	9.814	33.697	43.511	35.308	0.721	36.029	32.379	3.958	0.0	-3.650	0.0
59-60	9.366	35.144	44.510	36.024	1.590	37.614	37.614	5.321	0.0	0.0	0.0
60-61	10.569	46.071	56.639	31.943	1.584	33.527	33.527	4.629	0.0	0.0	8.513
61-62	11.978	58.516	70.494	19.803	0.0	19.803	19.803	4.837	0.0	0.0	45.844
62-63	12.777	69.986	82.763	28.822	0.884	29.706	29.706	4.704	0.0	0.0	48.353
63-64	9.867	42.222	52.089	38.362	3.745	42.107	42.107	4.867	0.0	0.0	12.661
64-65	15.346	64.425	79.771	32.250	2.225	34.475	34.475	4.808	0.0	0.0	45.961
65-66	8.856	38.862	47.718	42.451	3.055	45.506	43.789	3.527	0.0	-1.717	0.0
66-67	11.144	52.912	64.056	33.238	2.722	35.960	35.960	4.468	0.0	0.0	24.396
67-68	7.339	29.693	37.032	48.824	6.790	55.614	32.883	3.949	0.0	-22.730	0.0
68-69	8.612	26.229	34.841	40.962	3.475	44.437	39.128	4.210	0.0	-5.309	0.0
69-70	8.907	41.951	50.858	34.166	2.214	36.380	36.380	4.497	0.0	0.0	0.0
70-71	12.782	73.293	86.075	30.638	0.0	30.638	30.638	4.657	0.0	0.0	39.077
71-72	10.599	59.324	69.923	33.665	1.784	35.449	35.449	4.769	0.0	0.0	31.258
72-73	7.968	35.400	43.368	40.608	5.506	46.114	35.566	2.883	0.0	-10.548	8.795
73-74	11.492	51.358	62.850	36.015	2.332	38.347	38.347	4.635	0.0	0.0	31.111
74-75	12.090	61.803	73.893	27.286	1.992	29.278	29.278	4.710	0.0	0.0	23.824
75-76	8.251	38.916	47.167	39.787	1.925	41.712	41.712	4.530	0.0	0.0	11.899
76-77	11.496	52.280	63.776	24.477	0.500	24.977	24.977	4.619	0.0	0.0	23.451
77-78	9.031	54.757	63.788	31.075	1.176	32.251	32.251	4.840	0.0	0.0	25.857
78-79	7.857	41.962	49.819	40.638	3.700	44.338	44.338	4.976	0.0	0.0	12.944
79-80	15.382	52.996	68.378	27.327	0.135	27.462	27.462	4.509	0.0	0.0	23.968
80-81	9.744	63.825	73.569	39.300	3.781	43.081	36.358	4.468	0.0	-6.723	45.258
81-82	10.864	56.660	67.524	38.105	2.043	40.148	40.148	4.717	0.0	0.0	10.143
82-83	6.118	34.825	40.943	43.293	7.302	50.595	33.868	2.633	0.0	-16.776	4.491
83-84	9.236	69.011	78.247	33.076	4.007	37.083	37.083	4.681	0.0	0.0	43.293
AVE.	10.292	48.977	59.270	35.150	2.501	37.651	35.150	4.437	0.0	-2.503	19.928

- Outflow is irrigation water demand for the area of 5,300 ha with cropping intensity of 180% for the whole area.

The results of water balance study are summarized in TABLE E4-8. As is seen in the table, the required reservoir capacity to meet the design year with return period of about five years as much as possible is 34.0 MCM, which is the maximum size from the topography at the damsite. Even in this size, 10 years of water shortage will occur during 28 years.

Following table indicates the cost comparison in case of with and without Capayas dam.

Comparison with and without Capayas Dam

Item	With Capayas Dam	Without Capayas Dam
1. Reservoir Capacity		
Bayongan Dam	27.5 MCM	34.0 MCM
Capayas Dam	2.3 MCM	-
2. Water Shortage		
No. of Shortage Year	5 times	10 times
Shortage Volume/Year	3.0-18.7 MCM	0.9-23.4 MCM
3. Construction Cost (10^6₱)		
Dam and Reservoir	143.0	164.0
Irrigation Canal	80.0	84.0
Total	223.0 (100)	248.0 (111)

It is cleared that the project plan with Capayas dam is more recommendable from the following reasons;

- Economical construction cost,
- Effective utilization of available water sources of about 6.0 MCM from the Capayas catchment area,
- Stabilized water supply without so frequent water shortage, and
- Adequate reservoir operation without frequent carry over of reservoir storage capacity.

TABLE E4-8 RESULTS OF WATER BALANCE STUDY WITH BAYONGAN RESERVOIR ONLY (Cropping Intensity : 180%)

Item	Total Storage Capacity 27.5 MCM	30.0 MCM	32.0 MCM	34.0 MCM
1. Dam Dimension				
N.W.L.	50.0	50.9	51.6	52.2
Top of Dam Elevation (m)	53.0	53.9	54.6	55.2
2. Water Balance Study				
2-1 Cropping Area				
Dry Season	4,240	4,240	4,240	4,240
Wet Season	5,300	5,300	5,300	5,300
Total	9,540	9,540	9,540	9,540
2-2 Water Demand				
Average Year	42.1	42.1	42.1	42.1
Shortage Year	39.1-58.4	39.1-58.4	40.1-58.4	40.1-58.4
2-3 Water Shortage				
No. of shortage Year	14	11	10	10
Shortage Amount/Year	0.8-26.9	0.8-26.6	0.9-25.1	0.9-23.4
3. Construction Cost (10^6₱)				
Bayongan Dam	151.0	163.0	173.0	185.0
Canal 1/	76.0	76.0	76.0	76.0
Total	227.0	239.0	249.0	261.0

Note: 1/: Inclusive of construction costs of 4×10^6 pesos for crossing structures (conduit) at Bayang river.

TABLE E4-9 SUMMARY TABLE OF WATER BALANCE STUDY WITH BAYONGAN RESERVOIR ONLY

(CROPPING INTENSITY: 180%)

* RESERVOIR CAPACITY 27.50 (MCM)
* MAIN CANAL CAPACITY 2.13 (CU.M/S)

UNIT=(MCM)

YEAR	<---- INFLOW ----> C.AREA	MALINAO	TOTAL	<---- DEMAND ----> IRRIGAT.	CAPAYAS	TOTAL	INTAKE	EVAPO	LOSS	SHORT	SPILL
56-57	13.675	61.438	75.113	42.440	0.0	42.440	42.440	4.721	0.825	0.0	32.568
57-58	7.021	23.815	30.836	48.699	0.0	48.699	39.211	4.217	0.779	-9.489	0.0
58-59	9.814	33.697	43.511	40.973	0.0	40.973	36.124	3.386	0.698	-4.850	0.0
59-60	9.366	35.144	44.510	42.083	0.0	42.083	41.274	4.238	0.802	-0.809	0.0
60-61	10.569	46.071	56.639	38.986	0.0	38.986	38.986	4.946	0.825	0.0	0.0
61-62	11.978	58.516	70.494	24.625	0.0	24.625	24.625	4.820	0.825	0.0	34.790
62-63	12.777	69.986	82.763	34.888	0.0	34.888	34.888	4.607	0.825	0.0	42.443
63-64	9.867	42.222	52.089	44.434	0.0	44.434	44.434	4.425	0.825	0.0	13.857
64-65	15.346	64.425	79.771	39.145	0.0	39.145	36.741	4.490	0.802	-2.404	40.442
65-66	8.856	38.862	47.718	50.239	0.0	50.239	43.318	3.312	0.710	-6.921	0.0
66-67	11.144	52.912	64.056	41.286	0.0	41.286	39.599	4.054	0.756	-1.686	21.098
67-68	7.339	29.693	37.032	58.373	0.0	58.373	31.473	3.517	0.687	-26.900	0.0
68-69	8.612	26.229	34.841	49.598	0.0	49.598	38.110	3.845	0.710	-11.487	0.0
69-70	8.907	41.951	50.858	40.074	0.0	40.074	39.263	4.455	0.769	-0.812	0.0
70-71	12.782	73.293	86.075	36.415	0.0	36.415	36.415	4.576	0.825	0.0	29.137
71-72	10.599	59.324	69.923	40.063	0.0	40.063	40.063	4.809	0.825	0.0	28.558
72-73	7.968	35.400	43.368	47.707	0.0	47.707	34.923	3.080	0.687	-12.784	6.047
73-74	11.492	51.358	62.850	42.710	0.0	42.710	41.688	4.177	0.779	-1.022	29.883
74-75	12.090	61.803	73.893	34.509	0.0	34.509	34.509	4.737	0.825	0.0	17.648
75-76	8.251	38.916	47.167	48.313	0.0	48.313	48.313	4.799	0.825	0.0	6.921
76-77	11.496	52.280	63.776	30.310	0.0	30.310	30.310	4.743	0.825	0.0	16.123
77-78	9.031	54.757	63.788	37.192	0.0	37.192	37.192	4.605	0.825	0.0	15.828
78-79	7.857	41.962	49.819	48.377	0.0	48.377	48.377	4.596	0.825	0.0	10.928
79-80	15.382	52.996	68.378	33.651	0.0	33.651	33.651	4.626	0.825	0.0	14.368
80-81	9.744	63.825	73.569	48.757	0.0	48.757	37.873	4.156	0.733	-10.884	43.386
81-82	10.864	56.660	67.524	42.571	0.0	42.571	42.571	4.444	0.825	0.0	11.627
82-83	6.118	34.825	40.943	51.696	0.0	51.696	31.749	2.652	0.394	-19.946	1.623
83-84	9.236	69.011	78.247	41.326	0.0	41.326	39.273	4.430	0.779	-2.053	41.848
AVE.	10.292	48.977	59.270	42.123	0.0	42.123	38.121	4.267	0.773	-4.002	16.397

TABLE E4-10 SUMMARY TABLE OF WATER BALANCE STUDY WITH BAYONGAN RESERVOIR ONLY

(CROPPING INTENSITY: 180%)

* RESERVOIR CAPACITY 30.00 (MCM)
* MAIN CANAL CAPACITY 2.13 (CU.M/S)

UNIT=(MCM)

YEAR	<---- I N F L O W ---->			<---- D E M A N D ---->							
	C.AREA	MALINAO	TOTAL	IRRIGAT.	CAPAYAS	TOTAL	INTAKE	EVAPO	LOSS	SHORT	SPILL
56-57	13.675	61.438	75.113	42.440	0.0	42.440	42.440	4.888	0.900	0.0	32.458
57-58	7.021	23.815	30.836	48.699	0.0	48.699	41.806	3.927	0.850	-6.893	0.0
58-59	9.814	33.697	43.511	40.973	0.0	40.973	36.093	3.379	0.735	-4.880	0.0
59-60	9.366	35.144	44.510	42.083	0.0	42.083	41.072	4.367	0.875	-1.011	0.0
60-61	10.569	46.071	56.639	38.986	0.0	38.986	38.986	4.930	0.900	0.0	0.0
61-62	11.978	58.516	70.494	24.625	0.0	24.625	24.625	4.824	0.900	0.0	32.144
62-63	12.777	69.986	82.763	34.888	0.0	34.888	34.888	4.734	0.900	0.0	42.240
63-64	9.867	42.222	52.089	44.434	0.0	44.434	44.434	4.563	0.900	0.0	13.732
64-65	15.346	64.425	79.771	39.145	0.0	39.145	39.090	4.651	0.875	-0.055	40.279
65-66	8.856	38.862	47.718	50.239	0.0	50.239	43.264	3.306	0.775	-6.975	0.0
66-67	11.144	52.912	64.056	41.286	0.0	41.286	41.286	4.431	0.900	0.0	18.544
67-68	7.339	29.693	37.032	58.373	0.0	58.373	31.723	3.546	0.750	-26.649	0.0
68-69	8.612	26.229	34.841	49.598	0.0	49.598	38.054	3.831	0.775	-11.544	0.0
69-70	8.907	41.951	50.858	40.074	0.0	40.074	39.242	4.399	0.850	-0.833	0.0
70-71	12.782	73.293	86.075	36.415	0.0	36.415	36.415	4.672	0.900	0.0	26.530
71-72	10.599	59.324	69.923	40.063	0.0	40.063	40.063	4.774	0.900	0.0	28.382
72-73	7.968	35.400	43.368	47.707	0.0	47.707	37.113	3.348	0.750	-10.594	6.104
73-74	11.492	51.358	62.850	42.710	0.0	42.710	42.710	4.511	0.900	0.0	27.318
74-75	12.090	61.803	73.893	34.509	0.0	34.509	34.509	4.805	0.900	0.0	16.090
75-76	8.251	38.916	47.167	48.313	0.0	48.313	48.313	4.735	0.900	0.0	6.816
76-77	11.496	52.280	63.776	30.310	0.0	30.310	30.310	4.852	0.900	0.0	15.982
77-78	9.031	54.757	63.788	37.192	0.0	37.192	37.192	4.838	0.900	0.0	15.564
78-79	7.857	41.962	49.819	48.377	0.0	48.377	48.377	4.763	0.900	0.0	11.019
79-80	15.382	52.996	68.378	33.651	0.0	33.651	33.651	4.464	0.900	0.0	14.121
80-81	9.744	63.825	73.569	48.757	0.0	48.757	40.200	4.336	0.825	-8.557	43.293
81-82	10.864	56.660	67.524	42.571	0.0	42.571	42.571	4.589	0.900	0.0	9.041
82-83	6.118	34.825	40.943	51.696	0.0	51.696	33.891	2.816	0.469	-17.805	0.0
83-84	9.236	69.011	78.247	41.326	0.0	41.326	41.326	4.642	0.900	0.0	40.915
AVE.	10.292	48.977	59.270	42.123	0.0	42.123	38.702	4.354	0.851	-3.421	15.735

TABLE E4-11 SUMMARY TABLE OF WATER BALANCE STUDY WITH BAYONGAN RESERVOIR ONLY

(CROPPING INTENSITY: 180%)

* RESERVOIR CAPACITY 32.00 (MCM)
* MAIN CANAL CAPACITY 2.13 (CU.M/S)

UNIT=(MCM)

YEAR	<---- I N F L O W ---->			<---- D E M A N D ---->							
	C.AREA	MALINAO	TOTAL	IRRIGAT.	CAPAYAS	TOTAL	INTAKE	EVAPO	LOSS	SHORT	SPILL
56-57	13.675	61.438	75.113	42.440	0.0	42.440	42.440	4.971	0.960	0.0	32.216
57-58	7.021	23.815	30.836	48.699	0.0	48.699	43.769	4.014	0.907	-4.931	0.0
58-59	9.814	33.697	43.511	40.973	0.0	40.973	36.048	3.333	0.827	-4.925	0.0
59-60	9.366	35.144	44.510	42.083	0.0	42.083	41.027	4.354	0.933	-1.056	0.0
60-61	10.569	46.071	56.639	38.986	0.0	38.986	38.986	4.917	0.960	0.0	0.0
61-62	11.978	58.516	70.494	24.625	0.0	24.625	24.625	5.151	0.960	0.0	29.704
62-63	12.777	69.986	82.763	34.888	0.0	34.888	34.888	5.094	0.960	0.0	41.820
63-64	9.867	42.222	52.089	44.434	0.0	44.434	44.434	4.855	0.960	0.0	13.679
64-65	15.346	64.425	79.771	39.145	0.0	39.145	39.145	4.953	0.960	0.0	39.688
65-66	8.856	38.862	47.718	50.239	0.0	50.239	44.916	3.382	0.907	-5.323	0.0
66-67	11.144	52.912	64.056	41.286	0.0	41.286	41.286	4.598	0.960	0.0	16.371
67-68	7.339	29.693	37.032	58.373	0.0	58.373	33.245	3.892	0.827	-25.128	0.0
68-69	8.612	26.229	34.841	49.598	0.0	49.598	38.008	3.819	0.827	-11.589	0.0
69-70	8.907	41.951	50.858	40.074	0.0	40.074	39.201	4.386	0.907	-0.873	0.0
70-71	12.782	73.293	86.075	36.415	0.0	36.415	36.415	4.873	0.960	0.0	24.297
71-72	10.599	59.324	69.923	40.063	0.0	40.063	40.063	4.766	0.960	0.0	28.080
72-73	7.968	35.400	43.368	47.707	0.0	47.707	38.714	3.764	0.800	-8.993	6.263
73-74	11.492	51.358	62.850	42.710	0.0	42.710	42.710	4.851	0.960	0.0	25.118
74-75	12.090	61.803	73.893	34.509	0.0	34.509	34.509	5.025	0.960	0.0	15.701
75-76	8.251	38.916	47.167	48.313	0.0	48.313	48.313	4.938	0.960	0.0	6.518
76-77	11.496	52.280	63.776	30.310	0.0	30.310	30.310	4.703	0.960	0.0	16.064
77-78	9.031	54.757	63.788	37.192	0.0	37.192	37.192	4.826	0.960	0.0	15.456
78-79	7.857	41.962	49.819	48.377	0.0	48.377	48.377	4.772	0.960	0.0	10.741
79-80	15.382	52.996	68.378	33.651	0.0	33.651	33.651	4.707	0.960	0.0	14.027
80-81	9.744	63.825	73.569	48.757	0.0	48.757	42.018	4.662	0.907	-6.739	43.073
81-82	10.864	56.660	67.524	42.571	0.0	42.571	42.571	4.695	0.960	0.0	6.916
82-83	6.118	34.825	40.943	51.696	0.0	51.696	35.730	2.881	0.537	-15.966	0.0
83-84	9.236	69.011	78.247	41.326	0.0	41.326	41.326	4.942	0.960	0.0	38.636
AVE.	10.292	48.977	59.270	42.123	0.0	42.123	39.068	4.504	0.916	-3.054	15.156

TABLE E4-12 SUMMARY TABLE OF WATER BALANCE STUDY WITH BAYONGAN RESERVOIR ONLY

(CROPPING INTENSITY: 180%)

* RESERVOIR CAPACITY 34.00 (MCM)
* MAIN CANAL CAPACITY 2.13 (CU.M/S)

UNIT=(MCM)

YEAR	<---- I N F L O W ---->			<---- D E M A N D ---->							
	C.AREA	MALINAO	TOTAL	IRRIGAT.	CAPAYAS	TOTAL	INTAKE	EVAPO	LOSS	SHORT	SPILL
56-57	13.675	61.438	75.113	42.440	0.0	42.440	42.440	4.922	1.020	0.0	32.181
57-58	7.021	23.815	30.836	48.699	0.0	48.699	45.491	4.238	0.992	-3.209	0.0
58-59	9.814	33.697	43.511	40.973	0.0	40.973	36.002	3.327	0.878	-4.972	0.0
59-60	9.366	35.144	44.510	42.083	0.0	42.083	40.981	4.341	0.992	-1.102	0.0
60-61	10.569	46.071	56.639	38.986	0.0	38.986	38.986	4.903	1.020	0.0	0.0
61-62	11.978	58.516	70.494	24.625	0.0	24.625	24.625	5.073	1.020	0.0	27.669
62-63	12.777	69.986	82.763	34.888	0.0	34.888	34.888	4.931	1.020	0.0	41.924
63-64	9.867	42.222	52.089	44.434	0.0	44.434	44.434	4.780	1.020	0.0	13.551
64-65	15.346	64.425	79.771	39.145	0.0	39.145	39.145	4.966	1.020	0.0	39.876
65-66	8.856	38.862	47.718	50.239	0.0	50.239	46.384	3.749	0.963	-3.855	0.0
66-67	11.144	52.912	64.056	41.286	0.0	41.286	41.286	4.611	1.020	0.0	14.377
67-68	7.339	29.693	37.032	58.373	0.0	58.373	34.972	4.002	0.907	-23.401	0.0
68-69	8.612	26.229	34.841	49.598	0.0	49.598	37.963	3.808	0.878	-11.634	0.0
69-70	8.907	41.951	50.858	40.074	0.0	40.074	39.161	4.373	0.963	-0.914	0.0
70-71	12.782	73.293	86.075	36.415	0.0	36.415	36.415	4.966	1.020	0.0	22.195
71-72	10.599	59.324	69.923	40.063	0.0	40.063	40.063	4.907	1.020	0.0	27.958
72-73	7.968	35.400	43.368	47.707	0.0	47.707	40.290	4.120	0.878	-7.417	6.129
73-74	11.492	51.358	62.850	42.710	0.0	42.710	42.710	4.869	1.020	0.0	23.104
74-75	12.090	61.803	73.893	34.509	0.0	34.509	34.509	4.932	1.020	0.0	15.652
75-76	8.251	38.916	47.167	48.313	0.0	48.313	48.313	4.962	1.020	0.0	6.435
76-77	11.496	52.280	63.776	30.310	0.0	30.310	30.310	4.763	1.020	0.0	16.008
77-78	9.031	54.757	63.788	37.192	0.0	37.192	37.192	4.927	1.020	0.0	15.240
78-79	7.857	41.962	49.819	48.377	0.0	48.377	48.377	4.728	1.020	0.0	10.760
79-80	15.382	52.996	68.378	33.651	0.0	33.651	33.651	4.635	1.020	0.0	14.005
80-81	9.744	63.825	73.569	48.757	0.0	48.757	44.033	4.615	0.963	-4.723	43.053
81-82	10.864	56.660	67.524	42.571	0.0	42.571	42.571	4.670	1.020	0.0	4.903
82-83	6.118	34.825	40.943	51.696	0.0	51.696	37.547	2.984	0.609	-14.149	0.0
83-84	9.236	69.011	78.247	41.326	0.0	41.326	41.326	4.869	1.020	0.0	36.679
AVE.	10.292	48.977	59.270	42.123	0.0	42.123	39.431	4.535	0.978	-2.692	14.703

4.3 Water Balance Study with Capayas Reservoir Only

Construction of Capayas dam and its irrigation system could be completed at early stage than that of Bayongan system, because of small scale of works, so that the model of land reclamation, cultivation practices and water management could be also introduced in the Capayas system area prior to the completion of Bayongan dam and its service area with a little large scale.

Under the situation, water balance study with Capayas reservoir only was made for the periods of 28 years in case of several cropping intensity for the wet and dry seasons, in order to find out optimum cropping intensity to meet an available water resources in case of Capayas reservoir only.

As the results, an average cropping area for the period of 28 years was estimated at 1,320 ha, 700 ha in the dry season (1st crop) and 620 ha in the Wet Season (2nd crop) with the water shortage frequency of 10 years during 28 years, equivalent to about 3-years return period (see TABLE E4-13). In the normal year, 750 ha of land, which is equivalent to 65 percent of the proposed irrigation area of 1,160 ha under the Phase II project could be irrigated.

In this study, reservoir capacity of Capayas dam is 2.3 MCM with the consideration of full development stage of the project and same cropping pattern proposed in the project was applied. Furthermore, following rule to determine cropping area was planned considering an available water resources to be stored in the reservoir.

Dry Season		Wet Season	
Reservoir Water Level 1/	Cropping Area	Reservoir Water Level 2/	Cropping Area
WL 34.0 m	750 ha (65%)	WL 34.0 - 32.5m	750 ha (65%)
Less than WL 34.0 m	580 ha (50%)	WL 32.5 - 31.0m	520 ha (45%)
		Less than WL 31.0 m	230 ha (20%)

Note: 1/ ; Water level at late-October
2/ ; Water level at Mid-May

TABLE E4-13 RESULTS OF WATER BALANCE STUDY FOR 28 YEARS

Year	Cropping Area		Water Shortage		
	Dry Season (ha)	Wet Season (ha)	Dry Season (MCM)	Wet Season (MCM)	Total (MCM)
1956 - 1957	750	750	0	0	0
1957 - 1958	750	520	0	0	0
1958 - 1959	580	750	0	0	0
1959 - 1960	750	750	0	0	0
1960 - 1961	580	750	0	0	0
1961 - 1962	750	750	0	0	0
1962 - 1963	750	750	0	(0.054)	(0.054)
1963 - 1964	750	750	(0.062)	(0.086)	(0.148)
1964 - 1965	750	750	0	0.277	0.277
1965 - 1966	580	750	0	0.222	0.222
1966 - 1967	750	750	0	0.667	0.667
1967 - 1968	750	230	0	0	0
1968 - 1969	750	230	0.753	0	0.753
1969 - 1970	750	520	0	0	0
1970 - 1971	750	750	0	0	0
1971 - 1972	750	230	0	0	0
1972 - 1973	580	230	0.895	0.348	1.243
1973 - 1974	580	750	0	0.153	0.153
1974 - 1975	580	750	0	0.535	0.535
1975 - 1976	750	520	0	0	0
1976 - 1977	580	750	0	0	0
1977 - 1978	750	750	0	0	0
1978 - 1979	750	520	0.152	0	0.152
1979 - 1980	580	750	0	0	0
1980 - 1981	750	520	0	0	0
1981 - 1982	750	750	0	0	0
1982 - 1983	750	230	2.619	0.479	3.098
1983 - 1984	750	750	0	1.845	1.845
Average	700	620	0.160	0.167	0.327 (10 years)

Note: 1/ ; Figures in parenthesis show an allowable water shortage from view point of plant growth.

2/ ; Detailed calculation is shown in TABLE E4-14.

TABLE E4-14 SUMMARY TABLE OF WATER BALANCE STUDY WITH CAPAYAS DAM ONLY

* RESERVOIR CAPACITY 2.34 (MCM)
* MAIN CANAL CAPACITY 2.13 (CU.M/S)

YEAR	INFLOW (MCM)	DEMAND (MCM)	INTAKE (MCM)	DEM TO BAY (MCM)	FR BAY (MCM)	EVAPO (MCM)	SPILLAGE (MCM)	SHORTAGE (MCM)
56-57	14.489	6.802	6.802	0.0	0.0	1.027	6.850	0.0
57-58	7.736	6.648	6.648	0.0	0.0	0.917	0.642	0.0
58-59	10.577	5.994	5.994	0.0	0.0	1.055	3.439	0.0
59-60	10.083	6.959	6.959	0.0	0.0	0.992	2.568	0.0
60-61	11.402	5.740	5.740	0.0	0.0	1.030	4.577	0.0
61-62	12.873	4.217	4.217	0.0	0.0	1.079	7.767	0.0
62-63	13.584	5.715	5.661	-0.054	0.0	0.997	7.117	-0.054
63-64	10.672	7.324	7.175	-0.149	0.0	0.884	2.803	-0.149
64-65	16.062	6.232	5.955	-0.277	0.0	0.986	9.318	-0.277
65-66	9.631	7.283	7.061	-0.222	0.0	0.906	1.848	-0.222
66-67	11.868	6.581	5.913	-0.667	0.0	0.927	5.218	-0.667
67-68	7.950	5.490	5.490	0.0	0.0	0.822	1.829	0.0
68-69	9.181	5.507	4.754	-0.753	0.0	0.785	3.832	-0.753
69-70	9.609	5.539	5.539	0.0	0.0	0.938	3.322	0.0
70-71	13.701	6.004	6.004	0.0	0.0	1.053	6.834	0.0
71-72	11.379	4.111	4.111	0.0	0.0	0.988	6.497	0.0
72-73	8.585	4.530	3.287	-1.243	0.0	0.748	4.738	-1.243
73-74	12.327	6.248	6.095	-0.153	0.0	0.945	6.563	-0.153
74-75	12.809	5.131	4.596	-0.535	0.0	1.027	6.267	-0.535
75-76	8.881	6.409	6.409	0.0	0.0	0.959	2.526	0.0
76-77	12.190	4.527	4.527	0.0	0.0	1.039	5.991	0.0
77-78	9.595	6.146	6.146	0.0	0.0	0.981	2.659	0.0
78-79	8.438	6.732	6.580	-0.152	0.0	0.830	1.929	-0.152
79-80	16.134	4.232	4.232	0.0	0.0	0.997	10.385	0.0
80-81	10.317	6.034	6.034	0.0	0.0	0.963	3.510	0.0
81-82	11.484	7.013	7.013	0.0	0.0	0.959	3.702	0.0
82-83	6.534	6.415	3.318	-3.098	0.0	0.574	2.834	-3.098
83-84	9.754	6.436	4.591	-1.845	0.0	0.896	4.457	-1.845
AVE.	10.994	5.929	5.602	-0.327	0.0	0.939	4.644	-0.327