Table 5-21 AVERAGE 10-DAYS DISCHARGE AT GUILLEMARD BRIDGE (WITHOUT PROJECT)

(Unit=m³/s)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1958	1148.68	1005.58	521.10	243.13	261.11	348.41	165.25	244.13	227.77	539.58	1017.35	421.36
1958	675.02	720.76	541.20	255.45	438.54	360.95	179.55	534.69	401.02	722.17	913.34	427.36
1958	1273.27	499.50	407.37	234.21	475.79	452.49	165.87	582.31	394.64	637.60	659.80	491.68
1959	251.49	248.58	114.84	158.81	346.29	206.88	229.75	335.53	283.42	500.57	580.00	1067.40
1959	461.06	203.70	110.17	96.43	329.93	267.10	296.23	344.16	379.57	623.69	994.34	1194.63
1959	281.66	170.81	205.26	251.98	275.35	275.77	331.48	211.12	585.39	674.29	1492.64	766.71
1960	735.49	462.19	338.92	223.66	299.21	263.91	162.61	181.30	329.38	261.96	574.67	1075.56
1960	794.04	510.62	226.29	197.18	318.32	205.04	266.36	132.52	523.34	371.02	775.30	1004.01
1960	758.54	472.07	196.06	166.81	318.09	134.95	246.82	221.28	393.90	422.40	669.46	719.61
1961	1436.94	405.21	326.74	296.06	517.16	257.22	129.64	220.04	232.12	439.10	897.56	943.21
1961	1693.78	757.74	327.06	399.16	383.15	326.72	195.71	160.80	344.62	643.10	656.06	843.96
1961	608.92	474.87	271.43	447.03	213.11	195.64	263.99	131.79	351.00	463.81	725.65	1206.25
1962	1544.49	514.74	535.41	382.76	301.34	229.41	391.94	0.0	0.0	595.89	538.46	843.19
1962	875.46	360.52	431.53	266.91	432.56	235.67	260.08	0.0	0.0	513.52	636.72	1260.74
1962	1015.80	341.41	371.80	263.71	378.00	326.34	278.55	0.0	0.0	592.68	605.89	779.98
1963	1705.90	443.40	324.95	169.88	149.93	204.18	145.20	310.81	319.39	386.33	732.75	1441.14
1963	685.88	349.81	283.66	169.76	121.46	155.99	155.98	189.59	225.87	609.15	976.74	714.08
1963	518.05	325.02	245.99	101.02	206.82	151.69	212.96	262.43	306.22	542.77	1082.46	1065.23
1964	655.76	338.74	502.38	241.09	487.12	361.85	276.02	384.99	351.34	286.48	415.97	558.13
1964	500.16	607.70	387.71	264.88	464.04	389.59	360.07	300.27	617.05	396.41	462.25	624.98
1964	349.98	718.84	381.20	212.31	298.55	396.03	572.85	287.44	414.82	506.89	511.95	904.65
1965	460.56	248.33	198.64	261.01	358.11	281.23	357.32	255.68	508.21	524.55	734.15	2658.57
1965	299.90	239.76	163.95	221.49	304.88	188.94	261.18	389.19	464.23	992.99	916.39	1439.94
1965	225.41	277.34	135.88	220.06	337.12	273.59	207.48	401.04	587.91	730.10	916.73	1217.00
1966	1480.58	669.67	557.71	355.38	335.76	406.46	0.0	340.27	285.62	0.0	0.0	0.0
1966	973.80	531.41	417.63	305.60	359.63	316.55	0.0	326.74	386.15	0.0	0.0	0.0
1966	1485.25	574.21	507.72	417.38	375.39	417.90	0.0	568.87	645.64	0.0	0.0	0.0
1967	0.0	0.0	1416.40	540.17	608.20	327.25	388.67	295.30	310.23	331.82	554.40	0.0
1967	0.0	0.0	1760.30	462.61	635.71	340.69	458.84	427.46	334.73	490.22	739.25	0.0

1967	0.0	0.0	596.94	579.25	496.45	379.83	370.08	314.94	336.64	553.15	2727.42	0.0
1968	0.0	271.15	153.27	141.37	203.15	374.98	431.04	199.78	283.09	555.12	611.91	470.42
1968	0.0	219.38	183.33	132.48	241.19	394.43	295.45	164.52	442.59	651.63	369.79	674.84
1968	0.0	183.27	207.77	149.56	352.15	253.12	295.62	230.03	542.40	736.39	261.66	754.17
1969	897.08	284.67	160.79	148.14	139.10	195.94	243.28	126.70	312.72	274.40	573.50	2239.93
1969	605.87	240.78	146.13	90.03	168.16	218.73	185.77	186.05	161.79	395.04	875.04	1601.04
1969	379.66	179.27	122.87	73.07	300.89	280.23	137.10	378.81	212.76	566.75	1452.25	954.44
1970	1192.40	0.0	0.0	0.0	286.94	323.45	392.24	356.27	537.32	1089.12	727.38	682.32
1970	1413.60	0.0	0.0	0.0	320.53	193.52	269.68	466.20	451.94	949.81	896.07	666.20
1970	698.53	0.0	0.0	0.0	296.73	392.41	500.62	423.98	744.68	541.83	831.43	2022.83
1971	5592.68	742.35	744.71	409.81	256.75	373.32	0.0	0.0	459.19	265.63	561.48	1839.45
1971	1243.65	429.32	953.95	312.59	396.46	311.48	0.0	0.0	492.37	290.78	470.23	4475.46
1971	787.82	539.66	712.29	267.80	356.52	288.85	0.0	0.0	638.50	661.85	883.80	2458.85
1972	543.66	397.01	199.10	223.67	0.0	0.0	0.0	179.01	501.78	591.41	696.59	596.68
1972	354.49	347.11	182.57	256.29	0.0	0.0	198.70	226.40	624.97	556.39	873.52	4235.59
1972	340.44	332.91	186.10	0.0	0.0	0.0	193.39	337.87	749.68	420.50	825.50	1715.22
1973	1082.25	414.76	274.03	241.63	290.01	480.49	426.85	510.92	457.99	509.92	878.71	4740.50
1973	784.55	442.82	245.74	189.51	336.55	342.00	294.75	341.75	596.07	613.34	641.59	5112.69
1973	518.81	326.29	282.69	251.86	327.94	431.15	344.57	309.11	660.60	761.82	897.68	2230.96
1974	965.58	433.01	423.38	434.64	642.63	344.61	0.0	421.30	543.55	584.74	658.92	667.34
1974	642.46	493.17	323.76	419.70	563.46	399.76	411.89	304.40	534.80	749.15	747.31	612.05
1974	483.40	657.86	268.33	713.11	565.52	400.22	534.94	394.04	559.42	641.45	1288.01	1205.23
1975	2179.49	612.42	576.59	427.32	412.02	484.07	428.61	375.92	584.59	548.80	796.75	1166.62
1975	1705.26	444.72	384.30	335.59	537.25	395.45	382.22	311.93	521.03	496.89	748.67	1359.85
1975	812.14	941.59	383.69	333.42	661.36	329.33	0.0	366.04	837.00	667.89	2742.32	2055.68
1976	821.51	350.01	249.95	174.35	400.92	405.35	266.16	242.93	475.62	470.94	679.25	825.96
1976	553.70	300.91	237.39	254.78	443.83	426.52	417.89	312.69	399.66	848.17	777.39	854.34
1976	419.75	251.38	209.17	315.00	347.05	391.70	327.29	737.54	496.66	703.64	1637.66	1682.83
1977	1516.06	411.82	302.07	192.93	159.80	193.92	324.85	282.54	265.10	492.06	640.57	777.76
1977	644.16	524.21	249.50	180.28	203.24	222.11	323.73	426.85	289.78	968.23	1027.42	617.44
1977	435.43	390.69	234.43	158.50	174.11	204.30	216.26	467.95	244.33	668.93	857.20	606.53
1978	706.87	319.95	398.08	195.92	226.34	326.27	353.68	243.12	378.91	422.30	996.08	1650.48
1978	900.22	287.63	223.23	199.94	402.08	325.03	466.51	252.90	383.05	503.03	746.24	1131.50

1978	509.01	282.58	0.0	231.28	404.95	332.07	353.84	240.10	654.53	524.45	534.86	526.82
1979	647.91	383.03	296.53	227.11	340.94	336.72	192.66	209.08	292.39	279.48	863.84	1504.10
1979	361.53	300.89	238.71	220.20	308.38	449.44	261.04	207.49	543.75	405.35	1142.20	765.11
1979	387.08	334.42	191.18	369.27	270.57	258.83	397.41	267.24	458.00	457.32	4230.12	509.45
1980	441.76	280.54	262.87	155.18	224.48	274.36	171.07	501.97	330.28	709.78	795.32	1019.57
1980	338.44	206.62	287.51	189.09	388.40	267.90	251.82	524.47	340.29	803.22	600.59	907.80
1980	313.93	380.62	232.92	220.11	255.84	221.19	214.28	347.84	496.89	597.29	632.08	879.07
1981	586.03	306.38	197.26	214.47	249.84	280.10	147.01	156.57	229.12	292.38	710.44	877.92
1981	391.86	259.68	143.43	348.41	485.51	198.06	214.79	103.20	459.56	531.71	521.20	724.61
1981	267.92	213.08	133.90	201.11	465.19	162.57	309.43	130.63	168.56	508.37	410.04	365.15
1982	268.56	184.22	103.65	216.72	412.07	561.08	325.53	213.00	275.17	443.85	666.45	418.69
1982	0.0	144.81	121.92	291.00	186.87	498.66	296.59	316.72	390.58	597.17	701.95	2347.20
1982	0.0	104.00	116.95	458.58	457.06	268.75	286.36	396.41	562.55	585.78	524.53	1276.15
1983	673.54	296.50	173.30	125.81	150.95	191.76	225.64	450.68	447.71	338.33	468.17	4087.84
1983	528.26	241.94	158.61	107.50	186.89	216.99	312.36	215.36	0.0	354.18	621.93	3062.50
1983	395.26	205.20	162.74	102.92	164.05	178.11	327.76	418.05	376.56	472.36	335.87	1082.80
1984	674.08	0.0	1010.03	506.06	718.19	660.57	438.48	394.16	383.84	647.28	442.88	660.14
1984	548.33	934.09	625.94	535.23	649.81	535.05	457.53	312.07	435.49	440.52	396.04	461.35
1984	656.82	803.17	641.42	574.89	544.34	358.41	478.23	371.19	562.25	513.98	475.25	2952.03

Table 5-21 AVERAGE 10-DAYS DISCHARGE AT GUILLEMARD BRIDGE

(WITH LEBIR DAM BUT BEFORE WATER RELEASE OF 70 CMS OR 80 CMS)

(Unit=m^3/s)

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1958		1148.68	1005.58	521.10	243.13	261.11	648.41	165.25	244.13	227.77	539.58	1017.35	431.36
	TU	247.84	212.69	93.71	40.46	44.72	85.38	22.02	40.69	36.82	132.17	267.15	43.93
	Q	900.84	792.89	427.39	202.67	216.40	283.03	143.23	203.43	190.95	407.41	750.19	387.44
1958		675.02	720.76	541.20	255.45	430.54	360.95	179.55	534.69	401.02	722.17	913.34	427.36
	TU	131.51	142.74	98.64	43.37	86.72	68.35	25.40	109.49	77.84	154.71	227.53	42.40
	Q	543.51	578.02	442.56	212.09	351.82	292.59	154.15	425.21	323.18	567.46	685.81	384.96
1958		1273.27	499.50	407.37	284.21	475.79	452.49	165.87	582.31	394.64	637.60	659.80	491.68
	TU	278.44	88.40	65.77	38.34	95.54	90.03	22.16	120.76	76.33	122.49	130.95	84.56
	Q	994.83	411.10	341.59	195.87	380.25	362.46	143.70	461.55	318.31	515.11	528.85	407.13
1959		251.49	248.58	114.84	158.81	346.29	206.88	229.75	335.53	283.42	500.57	580.00	1067.40
	TU	27.49	26.78	3.11	20.49	64.88	31.87	37.29	62.33	50.00	70.29	100.55	286.22
	Q	224.00	221.81	111.73	138.31	281.41	175.01	192.46	273.19	233.42	430.28	479.45	781.18
1959		461.06	203.70	110.17	96.43	329.93	267.10	296.23	344.16	379.57	623.69	994.34	1194.63
	TU	78.96	15.75	0.50	5.72	61.01	46.15	53.03	64.38	72.76	117.19	258.39	334.69
	Q	382.10	187.94	109.66	90.71	268.93	220.97	243.20	279.79	306.81	506.50	735.95	859.94
1959		281.66	170.61	205.26	251.98	275.35	275.77	331.48	211.12	585.39	674.29	1492.64	768.71
	TU	34.90	7.69	20.58	42.55	46.09	48.19	61.38	32.88	121.49	136.47	448.21	172.44
	Q	246.76	163.13	194.66	209.43	227.27	227.59	270.11	178.24	463.90	537.82	1044.42	596.27
1960		735.49	462.19	338.92	223.66	299.21	283.91	162.61	181.30	329.38	261.96	574.67	1075.56
	TU	146.36	79.24	48.96	35.85	53.73	50.11	24.30	25.82	60.88	24.83	98.52	289.33
	Q	589.13	382.95	289.96	187.81	245.47	233.80	138.31	155.48	268.50	237.13	476.15	786.23
1960		794.04	510.62	226.29	197.18	318.32	205.04	266.36	132.52	523.34	371.02	775.30	1004.01
	TU	160.74	91.13	21.30	29.58	58.26	31.44	45.96	14.27	106.80	99.80	174.95	262.07
	Q	633.30	419.49	204.99	167.61	260.06	173.60	220.40	118.25	416.54	271.22	600.35	741.94
1960		758.54	472.07	196.06	166.81	313.09	134.95	246.82	221.28	393.90	422.40	669.46	719.61
	TU	152.02	81.66	13.88	22.39	58.21	14.84	41.33	35.28	76.15	45.02	134.63	153.73
	Q	606.52	390.40	182.18	144.42	259.89	120.10	205.49	186.00	317.75	377.38	534.83	565.87
1961		1436.94	405.21	326.74	296.96	317.16	257.22	129.64	220.04	232.12	439.10	897.56	943.21
	TU	318.63	65.24	45.97	52.99	105.34	43.79	13.59	34.99	37.85	59.90	221.52	238.91
	Q	1118.30	339.96	280.77	243.97	411.82	213.43	116.05	185.05	194.27	379.20	676.03	704.30
1961		1693.78	757.74	327.06	399.16	383.16	326.72	195.71	160.80	344.62	643.10	656.06	843.96
	TU	381.71	151.83	46.05	77.40	75.61	60.25	29.23	20.96	64.49	159.84	129.52	201.11
	Q	1312.06	605.92	281.01	321.76	309.54	266.47	166.48	139.84	280.13	483.26	526.53	642.86
1961		608.92	474.87	271.43	447.03	213.11	195.64	263.99	131.79	351.00	463.81	725.65	1206.25
	TU	115.27	82.35	32.39	88.73	33.35	29.21	45.40	14.10	66.00	56.29	156.03	339.12
	Q	493.64	392.52	239.04	359.30	179.76	166.43	213.60	117.70	285.00	407.52	569.61	867.14
1962		1544.49	514.74	535.41	382.76	301.34	229.41	391.94	0.0	0.0	595.89	538.46	843.19
	TU	345.05	92.14	97.22	73.52	54.24	37.21	75.69	0.0	0.0	106.60	84.72	200.81
	Q	1199.44	422.59	438.19	309.25	247.10	192.20	316.25	0.0	0.0	489.29	453.73	642.38
1962		875.46	360.52	431.53	266.91	232.56	235.67	260.08	0.0	0.0	513.52	636.72	1260.74
	TU	180.74	54.27	71.71	46.09	35.31	38.69	44.47	0.0	0.0	75.23	122.16	359.88
	Q	694.72	306.25	359.82	220.83	197.25	196.98	215.61	0.0	0.0	438.30	514.57	900.87
1962		1015.80	341.41	371.80	263.71	378.00	326.34	270.56	0.0	0.0	592.68	605.89	779.98
	TU	215.20	49.58	57.04	45.33	72.69	60.16	48.84	0.0	0.0	105.38	110.41	176.73
	Q	800.60	291.74	314.76	218.38	305.31	266.18	221.71	0.0	0.0	487.30	495.48	603.26

1963	1705.90	443.40	324.95	169.68	149.94	204.18	145.20	310.81	319.39	386.33	732.75	1441.14
TU	384.69	74.62	45.53	23.11	15.39	31.23	17.27	56.48	58.51	26.77	158.74	428.59
Q	1321.21	368.77	279.42	146.77	134.54	172.94	127.93	254.33	260.88	359.56	574.01	1012.54
1963	685.83	349.81	283.66	169.76	121.46	155.99	155.98	189.59	225.87	609.15	976.74	714.08
TU	134.18	51.64	35.39	23.09	11.65	19.83	19.82	27.78	36.37	111.66	251.69	151.63
Q	551.70	298.17	248.27	146.67	109.81	136.17	136.16	161.81	189.50	497.50	725.06	562.46
1963	518.05	325.02	245.99	101.02	206.82	151.69	212.96	262.43	306.22	542.77	1082.46	1065.23
TU	92.96	45.55	26.14	6.81	31.86	18.81	33.31	45.03	55.39	86.37	291.96	285.39
Q	425.09	279.47	219.85	94.21	174.96	132.88	179.65	217.40	250.83	456.40	790.50	779.83
1964	655.75	338.74	502.38	241.09	487.12	361.85	276.02	384.99	351.34	286.48	415.97	558.13
TU	126.78	48.92	89.11	39.97	98.22	68.56	48.25	74.04	66.08	22.02	38.07	92.22
Q	528.98	289.82	413.27	201.12	388.89	293.28	227.78	310.94	285.26	264.46	377.91	465.91
1964	500.16	607.70	387.71	264.83	464.04	389.59	360.07	300.27	617.05	396.41	462.25	624.98
TU	88.56	114.98	60.95	45.61	92.76	75.13	68.14	53.99	128.99	48.18	55.69	117.69
Q	411.60	492.72	326.77	219.28	371.28	314.45	291.93	246.28	488.06	348.23	406.56	507.30
1964	349.98	718.84	381.20	212.31	293.55	396.03	572.85	287.44	414.82	506.89	511.95	904.65
TU	51.68	142.27	59.35	33.16	53.58	76.66	118.52	50.95	81.11	72.70	74.63	224.22
Q	298.30	576.57	321.36	179.15	244.97	319.37	454.33	236.49	333.71	434.19	437.32	680.43
1965	460.56	248.33	198.64	261.01	358.11	281.23	357.32	255.68	508.21	524.55	734.15	2658.57
TU	78.84	26.72	14.51	44.69	67.66	49.48	67.49	43.43	103.22	79.43	159.27	892.37
Q	381.73	221.62	184.13	216.32	290.43	231.75	289.83	212.25	405.00	445.12	574.87	1766.20
1965	299.90	239.76	163.05	221.49	304.86	188.94	261.18	389.19	464.23	992.99	916.39	1439.94
TU	39.38	24.61	8.12	35.33	65.08	27.63	44.73	75.04	92.81	257.88	228.70	428.14
Q	260.52	215.15	155.83	186.16	249.80	161.31	216.45	314.15	371.43	735.11	687.70	1011.80
1965	225.41	277.34	135.88	220.06	337.12	273.59	207.48	401.04	587.91	730.10	918.73	1217.00
TU	21.09	33.84	2.84	34.99	62.71	47.67	32.02	77.84	122.09	157.73	229.59	343.21
Q	204.33	243.50	133.04	185.06	274.41	225.92	175.47	323.19	465.82	572.37	689.14	873.79
1966	1480.58	669.67	557.71	355.38	535.76	406.46	0.0	340.27	285.62	0.0	0.0	0.0
TU	329.35	130.19	102.70	67.03	92.39	79.13	0.0	63.46	50.52	0.0	0.0	0.0
Q	1151.23	539.48	455.01	288.35	443.37	327.34	0.0	276.82	235.10	0.0	0.0	0.0
1966	973.80	531.41	417.63	305.60	359.63	316.55	0.0	326.74	386.15	0.0	0.0	0.0
TU	204.89	96.24	68.30	55.25	58.04	57.04	0.0	60.25	74.32	0.0	0.0	0.0
Q	768.91	435.18	349.34	250.35	291.59	258.71	0.0	266.49	311.83	0.0	0.0	0.0
1966	1485.25	574.21	507.72	417.38	375.39	417.90	0.0	568.87	645.64	0.0	0.0	0.0
TU	330.50	106.75	90.42	81.71	71.77	81.84	0.0	117.58	135.76	0.0	0.0	0.0
Q	1154.75	467.46	417.30	335.66	303.62	336.07	0.0	451.29	509.88	0.0	0.0	0.0
1967	0.0	0.0	1416.40	540.17	508.20	327.25	386.67	295.30	310.23	331.82	554.40	0.0
TU	0.0	0.0	313.59	110.79	126.89	60.37	74.92	52.81	56.34	19.94	90.80	0.0
Q	0.0	0.0	1102.91	429.38	481.31	266.87	313.76	242.49	253.88	311.88	463.60	0.0
1967	0.0	0.0	1760.30	462.61	635.71	340.69	458.84	427.46	384.73	490.22	789.25	0.0
TU	0.0	0.0	398.05	92.42	136.41	63.56	91.53	84.10	73.98	66.35	180.26	0.0
Q	0.0	0.0	1362.25	370.19	502.30	277.14	367.31	343.36	310.75	423.87	608.98	0.0
1967	0.0	0.0	596.94	579.25	496.45	379.83	370.08	314.94	336.64	553.15	2727.42	0.0
TU	0.0	0.0	112.33	120.04	100.45	72.82	70.51	57.46	62.60	90.32	918.60	0.0
Q	0.0	0.0	484.60	459.22	396.01	307.01	299.57	257.48	274.04	462.83	1808.82	0.0
1968	0.0	271.15	153.27	141.37	203.15	374.96	431.04	199.78	283.09	555.12	611.91	470.42
TU	0.0	32.32	3.37	16.36	30.99	71.67	84.95	30.19	49.92	91.07	112.71	67.57
Q	0.0	238.83	149.90	125.01	172.16	303.30	346.10	169.59	233.17	464.05	499.20	402.85
1968	0.0	219.58	103.43	132.65	241.19	394.43	285.45	164.52	442.59	651.63	869.79	674.94

	TU	0.0	19.60	10.75	14.26	40.66	76.28	52.64	21.04	37.65	127.04	28.47	156.93
	Q	0.0	199.77	172.56	118.22	201.19	318.15	242.60	142.67	354.91	523.79	349.32	538.16
1968		0.0	183.27	207.77	149.56	352.15	253.12	295.62	230.03	542.40	738.39	261.66	754.17
	TU	0.0	10.74	16.75	18.30	66.27	42.82	52.89	37.36	111.31	160.89	10.96	166.90
	Q	0.0	172.54	191.02	131.26	285.88	210.30	242.74	192.68	431.09	577.50	250.69	587.27
1969		897.08	284.67	160.79	148.14	139.10	195.94	243.28	126.70	312.72	274.40	573.50	2239.93
	TU	186.05	35.64	5.82	17.97	15.63	29.29	40.49	12.89	56.93	6.99	98.08	732.89
	Q	711.04	249.03	154.97	130.18	123.28	166.66	202.79	113.81	255.79	267.40	475.43	1507.04
1969		605.87	240.78	146.13	90.03	168.16	218.73	185.77	186.05	161.79	395.04	875.04	1601.04
	TU	114.53	24.86	2.71	4.21	22.71	34.68	26.80	26.94	21.20	34.77	212.95	489.51
	Q	491.34	215.92	143.42	85.82	145.46	184.05	158.89	159.11	140.59	360.27	662.10	1111.53
1969		379.66	179.27	122.87	73.07	300.89	260.23	137.10	378.81	212.76	566.75	1452.25	954.44
	TU	58.97	9.75	2.18	2.21	54.13	49.24	15.35	72.58	33.27	95.50	432.83	243.19
	Q	320.69	169.52	120.69	70.86	246.76	230.99	121.75	306.23	179.50	471.25	1019.42	711.25
1970		1192.40	0.0	0.0	0.0	236.94	323.45	392.24	356.27	537.32	1039.12	727.38	682.32
	TU	258.58	0.0	0.0	0.0	50.83	59.47	75.76	67.24	110.11	294.50	156.70	139.53
	Q	933.83	0.0	0.0	0.0	236.11	263.97	316.48	289.02	427.21	794.62	570.69	542.79
1970		1413.60	0.0	0.0	0.0	320.53	193.52	269.68	466.20	451.94	949.81	896.07	666.20
	TU	312.90	0.0	0.0	0.0	50.78	28.71	46.74	93.27	89.90	241.43	220.96	133.39
	Q	1100.70	0.0	0.0	0.0	261.75	164.81	222.94	372.93	362.04	708.39	675.11	532.81
1970		698.53	0.0	0.0	0.0	296.73	392.41	500.62	423.98	744.68	541.83	831.43	2022.83
	TU	137.28	0.0	0.0	0.0	53.15	75.80	101.42	83.28	159.21	86.01	196.33	650.19
	Q	561.25	0.0	0.0	0.0	243.58	316.61	399.20	340.70	585.47	455.82	635.10	1372.65
1971		5592.68	742.35	744.71	409.81	256.75	373.32	0.0	0.0	459.19	285.63	561.48	1839.45
	TU	1339.27	148.05	148.62	79.62	43.68	71.26	0.0	0.0	91.61	8.37	93.50	560.33
	Q	4253.41	594.31	596.09	329.89	213.07	302.04	0.0	0.0	367.58	277.26	467.98	1259.12
1971		1243.65	426.32	253.95	312.59	396.46	311.48	0.0	0.0	492.37	290.78	470.23	4475.46
	TU	271.16	71.17	200.01	56.90	76.76	56.64	0.0	0.0	99.47	21.61	58.74	1584.50
	Q	972.49	358.16	753.93	255.69	319.70	254.84	0.0	0.0	392.90	269.17	411.50	2890.96
1971		787.82	539.66	712.29	267.80	356.52	288.55	0.0	0.0	638.50	661.85	883.80	2458.85
	TU	159.21	98.26	140.66	46.30	67.30	51.28	0.0	0.0	134.07	131.73	216.28	816.29
	Q	628.61	441.39	571.63	221.50	289.22	237.57	0.0	0.0	504.43	530.12	667.52	1642.56
1972		543.66	397.01	199.10	223.67	0.0	0.0	0.0	179.01	501.78	591.41	696.59	596.68
	TU	99.25	63.23	14.62	35.85	0.0	0.0	0.0	25.27	101.70	104.90	144.97	106.90
	Q	444.41	333.78	184.47	187.82	0.0	0.0	0.0	153.73	400.08	486.52	551.63	489.78
1972		354.49	347.11	182.57	256.29	0.0	0.0	198.70	226.40	624.97	556.39	873.52	4235.59
	TU	52.79	50.98	10.56	43.57	0.0	0.0	29.94	36.50	130.86	91.56	212.37	1493.12
	Q	301.71	296.14	172.00	212.72	0.0	0.0	168.76	189.91	494.10	464.84	661.16	2742.47
1972		340.44	332.91	186.10	0.0	0.0	0.0	193.39	337.87	749.68	420.50	825.50	1715.22
	TU	49.34	47.49	11.43	0.0	0.0	0.0	28.68	62.89	160.39	39.79	194.07	533.01
	Q	291.10	285.42	174.67	0.0	0.0	0.0	164.71	274.98	589.29	380.71	631.43	1182.22
1973		1082.25	414.76	274.03	241.63	290.01	480.49	426.85	510.92	457.99	509.92	878.71	4740.50
	TU	231.52	67.59	33.03	40.10	51.56	96.66	83.95	103.86	91.33	73.86	214.34	1685.47
	Q	850.73	347.17	241.01	201.53	238.46	383.84	342.89	407.06	366.66	436.07	664.37	3055.04
1973		784.55	442.92	245.74	180.51	336.55	342.00	294.75	341.75	596.07	613.34	641.59	5112.69
	TU	158.41	74.48	26.08	27.76	62.58	63.87	52.68	63.61	124.02	113.25	124.01	1827.25
	Q	626.14	368.34	219.66	161.75	273.98	278.13	242.07	277.94	472.05	500.09	517.58	3285.44
1973		518.81	326.29	282.69	251.86	227.94	431.15	344.57	309.11	660.60	761.82	897.68	2230.96
	TU	93.14	45.86	35.15	42.52	60.54	84.97	64.47	56.08	139.30	169.81	221.57	729.47
	Q	425.66	280.43	247.53	209.34	267.40	346.18	280.10	253.03	521.30	592.00	676.11	1501.49

1974	965.58	433.01	423.35	434.64	342.63	344.61	0.0	421.30	543.55	564.74	656.92	667.34
TU	202.87	72.07	69.71	85.80	135.04	64.40	0.0	82.64	111.59	102.35	130.62	133.82
Q	762.71	360.94	353.67	348.84	507.59	280.13	0.0	338.66	431.97	482.38	528.31	533.52
1974	642.46	493.17	323.76	419.70	563.46	399.76	411.89	304.40	534.80	749.15	747.31	612.05
TU	123.51	86.85	45.24	82.26	116.30	77.54	80.41	54.96	109.51	164.99	164.29	112.76
Q	518.95	406.32	278.52	337.44	447.16	322.22	331.47	249.43	425.29	584.16	583.03	499.29
1974	483.40	657.86	268.33	713.11	565.52	400.22	534.94	394.04	559.42	641.45	1288.01	1205.23
TU	84.45	127.29	31.63	151.73	116.79	77.65	109.55	76.19	115.34	123.96	370.26	338.73
Q	398.96	530.56	236.70	561.38	448.73	322.57	425.39	317.85	444.08	517.49	917.75	866.50
1975	2179.49	612.42	576.59	427.32	412.02	484.07	426.61	375.92	584.59	548.80	796.75	1166.62
TU	501.00	116.13	107.33	84.07	80.44	97.50	84.37	71.90	121.30	88.67	183.12	324.02
Q	1678.49	496.28	469.25	343.25	331.56	386.57	344.24	304.03	463.29	460.14	613.63	842.60
1975	1705.26	444.72	384.30	336.59	537.25	395.45	382.22	311.93	521.03	496.89	748.67	1359.65
TU	384.53	74.95	60.11	62.35	110.09	76.52	73.39	56.75	106.25	68.89	164.80	397.63
Q	1320.73	369.77	324.19	273.24	427.16	318.93	308.84	255.18	414.78	428.00	583.87	962.22
1975	812.14	941.59	383.69	333.42	561.36	329.33	0.0	366.04	837.00	667.89	2742.32	2055.68
TU	165.18	196.98	59.96	61.85	139.48	60.87	0.0	69.56	181.07	134.03	924.27	662.70
Q	646.96	744.61	323.73	271.57	521.88	268.46	0.0	296.48	655.94	533.86	1818.05	1392.98
1976	821.51	350.01	249.95	174.35	400.92	405.35	266.16	242.93	475.62	470.94	679.25	825.96
TU	167.49	51.69	27.11	24.17	77.82	78.86	45.91	40.41	95.50	59.00	138.36	194.25
Q	654.03	298.33	222.84	150.16	323.10	326.49	220.25	202.52	380.11	411.94	540.89	631.71
1976	553.70	300.91	237.39	254.78	443.83	426.52	417.89	312.69	399.66	648.17	777.39	854.34
TU	101.71	39.63	24.03	43.22	87.97	83.88	81.83	56.93	77.52	202.71	175.74	205.06
Q	451.99	261.28	213.36	211.57	355.85	342.64	336.06	255.77	322.14	645.46	601.64	649.28
1976	419.75	251.38	209.17	315.00	347.05	391.70	327.29	737.54	496.66	703.84	1637.66	1682.83
TU	68.82	27.46	17.10	57.47	65.06	75.63	60.38	157.52	100.48	147.73	503.46	520.67
Q	350.94	223.92	192.07	257.53	281.99	316.06	266.91	580.03	396.17	556.11	1134.20	1162.17
1977	1516.06	411.82	302.07	192.93	159.80	193.92	324.85	282.54	265.10	492.06	840.57	777.76
TU	338.07	66.87	39.91	28.57	20.73	28.81	59.81	49.79	45.66	85.05	199.81	175.89
Q	1177.99	344.95	262.16	164.36	139.07	165.12	265.05	232.75	219.44	407.01	640.76	601.88
1977	644.16	524.21	249.50	180.28	203.24	222.11	323.73	426.85	289.78	968.23	1027.42	617.44
TU	123.93	94.47	27.00	25.58	31.01	35.48	59.54	83.96	51.50	248.45	270.99	114.81
Q	520.23	429.74	222.50	154.71	172.22	186.63	264.19	342.89	238.28	719.79	756.43	502.63
1977	435.43	390.69	234.43	158.50	174.11	204.30	216.26	467.95	244.33	688.93	857.20	606.53
TU	72.67	61.68	23.30	20.42	24.12	31.26	34.09	95.69	40.74	142.05	206.15	110.66
Q	362.77	329.01	211.13	138.08	149.99	173.04	182.16	374.27	203.59	546.89	651.05	495.87
1978	706.87	319.95	398.08	195.92	226.34	326.27	353.68	243.12	378.91	422.30	996.08	1650.48
TU	139.33	44.31	63.49	29.28	36.48	60.14	66.63	40.45	72.60	51.63	259.05	508.34
Q	567.54	275.65	334.59	166.64	189.86	266.13	287.05	202.66	306.31	370.67	737.03	1142.14
1978	900.22	287.63	223.23	199.94	302.08	325.03	466.51	252.90	383.05	503.03	746.24	1131.50
TU	186.82	36.37	20.55	39.23	64.41	59.65	93.35	42.77	73.59	71.23	163.88	310.64
Q	713.40	251.26	202.68	169.71	247.66	265.18	373.17	210.13	309.47	431.80	582.36	820.86
1978	509.01	282.58	0.0	231.28	404.95	332.07	353.84	240.10	654.53	524.45	534.86	526.82
TU	90.74	35.13	0.0	37.65	79.77	61.51	66.67	39.74	137.66	79.39	83.36	80.29
Q	418.27	247.45	0.0	193.63	326.18	270.56	287.17	200.36	516.87	445.06	451.51	446.53
1979	647.91	383.03	296.53	227.11	340.94	336.72	192.66	209.08	292.39	279.48	863.84	1504.10
TU	124.85	59.60	38.55	36.66	63.61	62.62	28.51	32.39	52.12	2.50	208.68	452.58
Q	523.06	323.43	257.98	190.45	277.32	274.11	164.15	176.68	240.27	276.99	655.17	1051.52
1979	361.53	380.30	240.71	220.20	309.30	440.44	261.04	207.40	543.75	405.34	1142.20	765.11

TU	54.52	39.62	24.35	35.03	55.91	89.30	44.70	82.02	111.63	38.36	314.72	171.07
Q	307.02	261.26	214.36	185.17	252.47	360.14	216.34	175.47	432.12	366.98	827.48	594.04
1979	387.08	334.42	191.18	369.27	270.57	258.83	397.41	267.24	458.00	457.32	4230.12	509.45
TU	60.79	47.86	12.68	70.32	46.95	44.17	76.98	46.17	91.33	53.82	1491.04	73.67
Q	326.29	286.56	178.50	298.95	223.62	214.66	320.42	221.07	366.67	403.50	2739.08	435.77
1980	441.76	280.54	262.87	155.18	224.46	274.36	171.07	501.97	330.28	709.78	795.32	1019.57
TU	74.22	34.63	30.29	19.63	36.04	47.85	23.39	101.74	61.09	149.99	182.57	268.00
Q	367.54	245.92	232.58	135.55	188.44	226.51	147.67	400.23	269.19	559.79	612.74	751.57
1980	338.44	206.62	287.51	189.09	388.40	267.90	251.82	524.47	340.29	803.22	600.59	907.80
TU	48.84	16.47	36.34	27.66	74.85	46.32	42.52	107.07	63.46	185.58	108.39	225.42
Q	289.59	190.15	251.18	161.43	515.55	221.58	209.31	417.41	276.83	617.64	492.20	682.38
1980	313.93	360.62	232.92	228.11	255.84	221.19	214.28	347.84	496.89	597.29	632.08	879.07
TU	42.83	59.20	22.93	36.90	43.47	35.26	33.63	65.25	100.54	107.14	120.39	214.48
Q	271.11	321.41	209.99	191.21	212.37	185.93	180.66	282.59	396.35	490.15	511.69	664.59
1981	586.03	306.36	197.26	214.47	249.84	280.10	147.01	156.57	229.12	292.38	710.44	877.92
TU	109.65	40.97	14.17	33.67	42.05	49.21	17.70	19.96	37.14	107.54	150.24	214.04
Q	476.38	265.41	183.09	180.80	207.90	230.89	129.31	136.61	191.98	184.84	560.20	663.88
1981	391.86	259.68	143.43	348.41	405.51	193.06	214.79	103.20	459.56	531.71	521.20	724.61
TU	61.96	29.50	1.94	65.38	97.84	29.79	33.75	7.33	91.70	82.15	78.15	155.64
Q	329.89	230.18	141.49	283.03	387.66	168.28	181.05	95.87	367.86	449.55	443.05	568.97
1981	267.92	213.08	133.90	201.11	465.19	162.57	309.43	130.63	166.56	508.37	410.04	365.15
TU	31.53	18.06	4.59	30.51	93.03	21.38	56.15	13.82	22.80	81.66	53.97	37.99
Q	236.39	195.02	129.31	170.61	372.16	141.19	253.28	116.81	145.76	426.71	356.08	327.16
1982	268.56	184.22	103.65	216.72	412.07	561.08	325.53	213.00	275.17	443.85	666.45	418.69
TU	31.68	18.26	0.0	34.20	80.46	115.74	59.97	33.32	48.04	48.69	135.48	39.10
Q	236.88	165.97	103.65	182.52	351.62	445.34	265.56	179.68	227.13	395.17	532.97	379.59
1982	0.0	144.81	121.92	291.00	186.87	498.66	296.59	316.72	390.58	597.17	701.95	2347.20
TU	0.0	15.09	7.29	51.79	27.14	100.96	53.12	57.58	75.37	107.09	147.01	773.75
Q	0.0	129.72	114.63	239.21	159.73	397.70	243.48	258.84	315.22	490.08	554.95	1573.45
1982	0.0	104.00	116.95	458.56	457.08	268.75	286.36	396.41	562.55	585.78	524.53	1276.15
TU	0.0	0.0	8.22	91.47	91.11	46.52	50.69	76.75	116.09	102.75	79.42	365.75
Q	0.0	104.00	108.73	367.11	365.96	222.22	235.67	319.66	446.47	483.03	445.11	910.41
1983	673.54	296.50	173.30	125.31	150.95	191.76	225.64	450.68	447.71	338.33	468.17	4087.64
TU	131.14	38.55	8.29	12.68	18.63	28.29	36.32	89.60	86.89	20.36	57.95	1436.84
Q	542.39	257.96	165.01	113.13	132.32	163.46	189.32	361.08	358.82	317.97	410.22	2651.00
1983	528.26	241.94	156.61	107.50	136.89	216.99	312.36	215.36	0.0	354.18	621.93	3062.50
TU	95.46	25.15	4.68	8.34	27.14	34.27	56.85	53.88	0.0	16.88	116.52	1046.24
Q	432.79	216.80	153.93	99.15	109.75	182.72	255.52	161.48	0.0	337.30	505.41	2016.26
1983	395.26	205.20	162.74	102.92	184.05	178.11	327.76	418.05	376.56	472.36	335.87	1082.80
TU	62.80	16.12	6.43	7.26	26.47	25.06	60.50	81.87	72.05	59.55	22.54	292.09
Q	332.46	189.00	156.32	95.66	157.58	153.05	267.27	336.18	304.51	412.82	313.33	790.71
1984	674.08	0.0	1010.03	506.06	713.19	660.57	438.48	394.16	383.84	647.28	442.86	660.14
TU	131.28	0.0	213.79	102.71	152.93	139.29	86.71	76.21	73.77	126.18	48.32	131.08
Q	542.80	0.0	796.24	403.35	565.26	521.28	351.77	317.94	310.07	521.10	394.56	529.06
1984	548.33	934.09	625.94	535.23	649.81	535.05	457.53	312.07	435.49	440.52	396.04	461.35
TU	100.39	195.14	119.46	109.62	136.74	109.57	91.22	56.78	86.00	52.97	30.47	55.35
Q	447.94	738.96	506.49	425.62	513.07	425.48	366.31	255.29	349.49	387.54	365.57	406.00
1984	656.82	803.17	641.42	574.89	544.34	358.41	478.23	371.19	562.25	513.98	475.25	2952.03
TU	127.04	162.88	123.26	119.01	111.77	67.75	96.12	70.78	116.01	75.40	60.65	1004.16
Q	529.78	640.12	518.16	455.88	432.57	290.66	382.11	300.41	446.24	438.58	414.60	1947.87

Table 6-2-1(1) Reservoir Operation/Energy Porduction

L.W.L. = 50 ALPHA = 4

Item	Qf / NWL	50 ㎥/s	60 ㎥/s	70 ㎥/s	80 ㎥/s	90 ㎥/s	100 ㎥/s
Energy (GWh) U : Dry M : Wet L : Total	85	128.98	141.07	153.87	164.99	165.91	167.88
		230.84	236.32	236.75	227.21	211.91	205.15
		359.89	377.38	390.62	392.21	377.81	372.98
	80	118.87	128.75	139.73	147.63	146.52	147.75
		212.12	218.39	217.53	208.48	198.85	192.55
		331.01	347.14	357.27	356.13	345.37	340.30
	75	108.1	115.67	124.22	127.71	128.23	127.74
		193.45	198.89	196.63	191.13	186.69	181.22
		301.55	314.55	320.85	318.84	314.93	308.98
	70	96.54	102.2	107.41	110.53	110.41	109.36
		173.64	177.91	175.9	173.31	172.13	168.08
		270.18	280.09	283.32	283.83	282.55	277.45
Power (MW) U:Dry/Ave M:Wet/Ave L:Max.	85	93.15	110.98	127.65	139.68	139.91	139.7
		93.43	111.35	127.88	139.41	139.96	140.51
		94.0	112.8	131.6	150.4	169.2	188.0
	80	84.38	100.2	114.63	123.4	122.0	123.25
		84.71	100.6	114.83	123.0	123.5	127.83
		85.4	102.4	119.5	136.6	153.6	170.7
	75	75.48	88.9	100.43	105.2	106.48	106.25
		75.91	89.5	100.66	106.71	110.96	114.5
		76.7	92.1	107.4	122.8	138.1	153.5
	70	66.45	78.15	85.41	90.3	91.48	90.53
		67.0	77.3	87.11	93.06	99.5	101.95
		68.1	81.7	95.4	109.0	122.6	136.2
Water Level (m) U : Min. L : Ave.	85	81.0	78.0	73.9	67.1	51.1	50.1
		84.5	84.1	83.4	81.5	77.5	74.4
	80	75.1	71.0	64.2	52.3	50.9	50.1
		79.5	79.0	78.1	75.8	72.4	70.4
	75	68.2	62.5	52.6	50.5	50.1	50.2
		74.3	73.6	72.5	70.1	68.1	66.3
	70	60.9	51.6	51.2	50.0	50.3	50.0
		69.2	68.2	66.9	65.3	64.0	62.5

TWL = 27.0m

Legend: U = Upper Column
M = Middle Column
L = Lower Column

Item	Qf / NWL	50 ㎥/s	60 ㎥/s	70 ㎥/s	80 ㎥/s	90 ㎥/s	100 ㎥/s
Power Discharge (10^9 ㎥)	85	2.5644	2.0801	1.5545	0.9484	0.1867	0.1687
	(3.2958)	(0.7314)	(1.2157)	(1.7413)	(2.3474)	(3.1091)	(3.1271)
	80	1.7004	1.2665	0.7452	0.2149	0.1840	0.1680
	(2.392)	(0.6916)	(1.1255)	(1.6468)	(2.1771)	(2.208)	(2.224)
	75	1.0290	0.6408	0.2224	0.1752	0.1694	0.1712
	(1.6858)	(0.6568)	(1.045)	(1.4634)	(1.5106)	(1.5164)	(1.5146)
	70	0.4589	0.1970	0.1898	0.1675	0.1716	0.1672
	(1.177)	(0.6281)	(0.98)	(0.9872)	(1.0095)	(1.0054)	(1.0098)
Spilling Water (㎥/s)	85	18.8	14.3	9.8	7.1	5.0	2.7
	80	19.0	14.2	10.4	7.3	5.4	3.7
	75	19.6	14.4	10.8	7.5	5.5	4.0
	70	19.9	14.7	11.3	8.2	6.2	4.5
Months of Generation Stop	85	0	0	0	0	7	23
	80	0	0	0	0	16	32
	75	0	0	1	7	24	40
	70	0	0	4	16	31	51
Possible* Generating Hours (%)	85	100	100	100	100	98.3	94.5
	80	100	100	100	100	96.2	92.4
	75	100	100	99.8	98.3	94.3	90.5
	70	100	100	99.0	96.2	92.6	87.9

* Number of Months in percentage

Taking m (months) = number of months with generation stop,

$$\text{Possible Generating Hours} = \frac{35\times 12 - m}{35\times 12} \cdot 100$$

Table 6-2-1(2) Reservoir Operation/Energy Porduction

L.W.L.= 50 ALPHA = 5

Item	Qf / NWL	50 m³/s	60 m³/s	70 m³/s	80 m³/s	90 m³/s	100 m³/s
Energy (GWh) U : Dry M : Wet L : Total	85	129.16	141.07	153.87	164.99	165.91	167.83
		248.85	251.25	249.13	236.51	248.99	209.32
		377.84	392.30	403.00	401.51	384.88	377.16
	80	119.01	128.75	139.73	147.63	146.52	148.84
		229.47	231.65	229.65	217.09	206.11	200.25
		348.48	360.41	369.39	364.73	352.66	349.09
	75	108.23	115.67	124.22	127.71	128.23	127.74
		208.72	210.9	207.6	199.2	193.29	185.99
		316.94	326.55	331.83	326.91	321.52	313.74
	70	96.67	102.2	107.41	110.53	110.41	109.36
		187.44	188.78	185.73	181.17	178.98	173.34
		284.10	290.96	293.16	291.68	289.4	282.69
Power (MW) U:Dry/Ave M:Wet/Ave L:Max.	85	116.4	138.73	159.55	174.56	174.9	174.61
		116.8	139.15	159.81	174.3	174.96	175.65
		117.5	141.0	164.5	188.0	211.5	235.0
	80	105.51	125.26	143.26	154.25	152.51	154.36
		105.91	125.73	143.53	153.73	154.36	160.03
		106.7	128.0	149.4	170.7	192.1	213.4
	75	94.35	111.18	125.56	131.5	133.13	132.81
		94.88	111.86	125.81	133.38	138.63	143.1
		95.9	115.1	134.3	153.5	172.7	191.8
	70	83.08	96.6	106.78	112.86	114.36	113.15
		83.76	97.71	108.93	116.33	124.38	127.4
		85.1	102.2	119.2	136.2	153.2	170.3
Water Level (m) U : Min. L : Ave.	85	81.0	78.0	73.9	67.1	51.1	50.1
		84.5	84.1	83.4	81.5	77.5	74.4
	80	75.1	71.0	64.2	52.3	51.1	51.4
		79.5	79.0	78.1	75.8	72.4	70.5
	75	68.2	62.5	61.0	50.5	50.1	50.2
		74.3	73.6	72.5	70.1	68.1	66.3
	70	60.9	51.6	51.2	50.4	50.3	50.0
		69.2	68.2	66.9	65.3	64.0	62.5

TWL = 27.0m

Legend: U = Upper Column
M = Middle Column
L = Lower Column

Item	Qf / NWL	50 ㎥/s	60 ㎥/s	70 ㎥/s	80 ㎥/s	90 ㎥/s	100 ㎥/s
Power Discharge (10^8 ㎥)	85 (3.2958)	2.5644 (0.7314)	2.0801	1.5545	0.9484	0.3364	0.1687
	80 (2.392)	1.7004	1.2665	0.7452	0.2149	0.1872	0.1942
	75 (1.6858)	1.2090	0.6408	0.5537	0.1752	0.1694	0.1712
	70 (1.177)	0.5489	0.1970	0.1898	0.1743	0.1726	0.1672
Spilling Water (㎥/s)	85	14.6	10.7	6.9	4.9	3.3	1.7
	80	14.9	10.7	7.2	5.0	3.5	2.2
	75	15.1	10.9	7.6	5.2	3.6	2.5
	70	15.4	11.1	8.0	5.6	3.9	2.7
Months of Generat'n Stop	85	0	0	0	0	7	23
	80	0	0	0	0	16	32
	75	0	0	1	7	24	39
	70	0	0	4	16	32	51

Table 6-2-1(3) Reservoir Operation/Energy Porduction

L.W.L. = 50 ALPHA = 6

Item	Qf / NWL	50 ㎥/s	60 ㎥/s	70 ㎥/s	80 ㎥/s	90 ㎥/s	100 ㎥/s
Energy (GWh) U : Dry M : wet L : Total	85	129.16	141.07	153.87	164.99	165.91	167.83
		262.02	262.77	257.03	242.31	221.38	209.59
		391.18	403.83	410.89	407.31	387.26	377.43
	80	119.0	128.75	139.73	147.63	146.52	147.75
		240.54	241.57	237.45	222.51	208.5	197.88
		359.54	370.33	377.19	370.15	355.03	345.64
	75	108.23	115.67	124.22	127.71	128.23	128.53
		219.81	219.91	215.3	204.29	195.61	188.18
		328.05	335.56	339.51	332.00	323.83	316.69
	70	96.67	102.2	107.41	186.3	110.41	109.36
		197.46	196.85	192.73	110.53	181.61	173.85
		294.12	299.04	300.15	296.81	292.02	283.21
Power (MW) U:Dry/Ave M:Wet/Ave L:Max.	85	139.68	166.46	191.46	209.5	209.88	209.56
		140.13	166.98	191.8	209.16	209.93	210.76
		141.0	169.2	197.4	225.6	253.8	282.0
	80	126.55	150.3	171.93	185.13	183.0	184.83
		127.08	150.9	172.25	184.46	185.23	191.76
		128.0	153.6	179.3	204.9	230.5	256.1
	75	113.23	133.43	150.68	157.8	159.75	159.38
		113.86	134.23	150.96	160.06	166.38	171.83
		115.1	138.1	161.1	184.2	207.2	230.2
	70	99.71	117.25	128.15	135.45	137.23	135.76
		100.53	115.98	130.7	139.56	149.25	152.86
		102.2	122.6	143.0	163.5	183.9	204.3
Water Level (m) U : Min. L : Ave.	85	81.0	78.0	73.9	67.1	51.1	50.1
		84.5	84.1	83.4	81.5	77.5	74.4
	80	75.1	71.0	64.2	52.3	50.9	50.1
		79.5	79.0	78.1	75.8	72.4	70.4
	75	68.2	62.5		51.3	50.1	50.2
		74.3	73.6	72.5	70.1	68.1	66.3
	70	60.9	51.6	51.2	50.0	50.3	50.1
			68.2	66.9	65.3	64.0	62.5

TWL = 27.0m

Legend: U = Upper Column

M = Middle Column

L = Lower Column

Item	Qf / NWL	50 ㎥/s	60 ㎥/s	70 ㎥/s	80 ㎥/s	90 ㎥/s	100 ㎥/s
Power Discharge (10^3 ㎥)	85 (3.2958)	2.5644	2.0801	1.5545	0.9484	0.1867	0.1687
	80 (2.392)	1.7004	1.2665	0.7452	0.2149	0.1840	0.1680
	75 (1.6858)	1.0290	0.6408	0.5537	0.1914	0.1694	0.1712
	70 (1.177)	0.5489	0.1970	0.1898	0.1675	0.1716	0.1693
Spilling Water (㎥/s)	85	11.4	8.0	5.0	3.5	2.8	1.7
	80	11.6	8.1	5.1	3.6	2.9	2.3
	75	11.9	8.3	5.3	3.7	2.9	2.1
	70	12.1	8.5	5.7	3.9	3.0	2.5
Months of Generat'n Stop	85	0	0	0	0	7	23
	80	0	0	0	0	16	32
	75	0	0	1	7	24	40
	70	0	0	4	16	33	51

Table 6-2-1(4) Reservoir Operation/Energy Porduction

L.W.L. = 60 ALPHA = 4

Item	Qf / NWL	50 m³/s	60 m³/s	70 m³/s	80 m³/s	90 m³/s	100 m³/s
Energy (GWh) U : Dry M : Wet L : Total	85						
	80				124.8		
					211.34		
					359.19		
	75			20.71	149.68		
				32.92	174.06		
				321.79	323.75		
	70		16.98	18.21			
			29.65	34.20			
			279.77	314.45			
Power (MW) U:Dry/Ave M:Wet/Ave L:Max.	85						
	80				123.1		
					123.3		
					136.6		
	75			100.4	106.95		
				100.7	108.88		
				107.4	122.8		
	70		77.1	84.7			
			78.2	89.5			
			81.7	107.5			
Water Level (m) U : Min. L : Ave.	85						
	80				60.7		
					76.0		
	75			61.6	60.5		
				72.6	71.1		
	70		61.1	60.3			
			68.3	67.9			

TWL = 27.0

Legend: U = Upper Column
M = Middle Column
L = Lower Column

Item	Qf / NHL	50 ㎥/s	60 ㎥/s	70 ㎥/s	80 ㎥/s	90 ㎥/s	100 ㎥/s
Power Discharge (10^9 ㎥)	85						
	80 (2.392)				0.5408 (1.8512)		
	75 (1.6858)			0.5836 (1.1022)	0.5274 (1.1584)		
	70 (1.177)		0.5600 (0.617)	0.5158 (0.6612)			
Spilling Water (㎥/s)	85						
	80				7.5		
	75			11.2	7.7		
	70		15.0	4.8			
Months of Generat'n Stop	85						
	80				4		
	75			99.3% 3	11		
	70		99.5% 2	96.9% 13			

Table 6-2-1(5) Reservoir Operation/Energy Porduction

L.W.L. = 60 ALPHA = 5

Item	Qf / NWL	50 ㎥/s	60 ㎥/s	70 ㎥/s	80 ㎥/s	90 ㎥/s	100 ㎥/s
Energy (GWh) U : Dry M : Wet L : Total	85						
	80				147.86		
					221.32		
					369.19		
	75			20.71			
				34.84			
				333.31			
	70		16.98	17.92			
			31.53	35.10			
			291.06	318.13			
Power (MW) U:Dry/Ave M:Wet/Ave L:Max.	85						
	80				153.85		
					154.15		
					170.7		
	75			125.4	133.72		
				125.9	136.08		
				134.3	153.5		
	70		96.4	105.5			
			97.7	111.0			
			102.2	120.1			
Water Level (m) U : Min. L : Ave.	85						
	80						
	75			61.5			
				72.6			
	70		60.9	60.3			
			68.3	67.7			

TWL = 27.0m

Legend U = Upper Column

M = Middle Column

L = Lower Column

Item	Qf / NWL	50 ㎥/s	60 ㎥/s	70 ㎥/s	80 ㎥/s	90 ㎥/s	100 ㎥/s
Power Discharge (10^9 ㎥)	85						
	80						
	75 (1.6858)			0.5836 (1.1022)			
	70 (1.177)		0.5600 (0.617)	0.5157 (0.6612)			
Spilling Water (㎥/s)	85						
	80						
	75			7.8			
	70		11.3	3.0			
Months of Generat'n Stop	85						
	80						
	75			3			
	70		2	13			

Table 6-2-1(6) Reservoir Operation/Energy Porduction

L.W.L. = 60 ALPHA = 6

Item	Qf / NWL	50 m³/s	60 m³/s	70 m³/s	80 m³/s	90 m³/s	100 m³/s
Energy (GWh) U : Dry M : Wet L : Total	85						
	80				147.86		
					227.15		
					375.00		
	75			20.71			
				36.31			
				342.12			
	70		16.98	17.89			
			32.94	35.34			
			299.56	319.37			
Power (MW) U:Dry/Ave M:Wet/Ave L:Max.	85						
	80				184.62		
					184.95		
					204.9		
	75			150.5	160.43		
				151.0	163.32		
				161.1	184.2		
	70		115.7	110.0			
			117.2	118.9			
			122.6	122.6			
Water Level (m) U : Min. L : Ave.	85						
	80						
	75			61.6			
				72.6			
	70		60.9	60.3			
			68.3	67.6			

TWL = 27.0m

Legend: U = Upper Column
M = Middle Column
L = Lower Column

Item	Qf / NWL	50 ㎥/s	60 ㎥/s	70 ㎥/s	80 ㎥/s	90 ㎥/s	100 ㎥/s
Power Discharge (10^9 ㎥)	85						
	80						
	75 (1.6858)			0.5836 (1.1022)			
	70		0.5600 (0.617)	0.5155 (0.6615)			
Spilling Water (㎥/s)	85						
	80						
	75			5.2			
	70		8.5	2.2			
Months of Generat'n Stop	85						
	80						
	75			3			
	70		2	96.4% 13			

Table 6-2-1(7) Reservoir Operation/Energy Porduction

L.W.L. = 65 ALPHA = 4

Item	Qf / NWL	50 m³/s	60 m³/s	70 m³/s	80 m³/s	90 m³/s	100 m³/s
Energy (GWh) U : Dry M : Wet L : Total	85						
	80				24.30		
					35.70		
					360.01		
	75						
	70		16.18				
			30.60				
			280.70				
Power (MW) U:Dry/Ave M:Wet/Ave L:Max.	85						
	80				122.1		
					124.1		
					136.6		
	75						
	70		73.3				
			79.3				
			81.7				
Water Level (m) U : Min. L : Ave.	85						
	80				65.1		
					76.3		
	75						
	70		66.1				
			68.9				

TWL = 27.0m

Legend: U = Upper Column
M = Middle Column
L = Lower Column

Item	Qf / NWL	50 ㎥/s	60 ㎥/s	70 ㎥/s	80 ㎥/s	90 ㎥/s	100 ㎥/s
Power Discharge (10^9 ㎥)	85						
	80 (2.392)				0.8024 (1.5896)		
	75						
	70		0.8722 (0.8136)				
Spilling Water (㎥/s)	85						
	80				7.3		
	75						
	70		15.7				
Months of Generat'n Stop	85						
	80				99.0% 4		
	75						
	70		96.2% 16				

Table 6-2-1(8) Reservoir Operation/Energy Porduction

L.W.L. = 65 ALPHA = 5

Item	Qf / NWL	50 m³/s	60 m³/s	70 m³/s	80 m³/s	90 m³/s	100 m³/s
Energy (GWh) U : Dry M : Wet L : Total	85						
	80				24.30		
					37.14		
					368.61		
	75						
	70		16.18				
			32.60				
			292.70				
Power (MW) U:Dry/Ave M:Wet/Ave L:Max.	85						
	80				152.65		
					155.17		
					170.17		
	75						
	70		91.6				
			99.1				
			102.2				
Water Level (m) U : Min. L : Ave.	85						
	80				65.1		
					76.3		
	75						
	70		66.1				
			68.9				

TWL = 27.0m

Legend: U = Upper Column
M = Middle Column
L = Lower Column

Item	Qf / NWL	50 ㎥/s	60 ㎥/s	70 ㎥/s	80 ㎥/s	90 ㎥/s	100 ㎥/s
Power Discharge (10^8 ㎥)	85						
	80 (2.3920)				0.8024 (1.5896)		
	75						
	70		0.8010 (0.9690)				
Spilling Water (㎥/s)	85						
	80				5.0		
	75						
	70		11.8				
Months of Generat'n Stop	85						
	80				8		
	75						
	70		16				

Table 6-2-1(9) Reservoir Operation/Energy Porduction

L.W.L. = 65 ALPHA = 6

Item	Qf / NWL	50 m³/s	60 m³/s	70 m³/s	80 m³/s	90 m³/s	100 m³/s
Energy (GWh) U : Dry M : Wet L : Total	85						
	80				24.30		
					38.04		
					374.03		
	75						
	70		16.18				
			34.06				
			301.46				
Power (MW) U:Dry/Ave M:Wet/Ave L:Max.	85						
	80				183.17		
					186.22		
					204.9		
	75						
	70		109.97				
			118.92				
			122.6				
Water Level (m) U : Min. L : Ave.	85						
	80				61.5		
					76.3		
	75						
	70		65.1				
			68.9				

TWL = 27.0m

Legend: U = Upper Column
M = Middle Column
L = Lower Column

Item	Qf / NWL	50 ㎥/s	60 ㎥/s	70 ㎥/s	80 ㎥/s	90 ㎥/s	100 ㎥/s
Power Discharge (10^8 ㎥)	85						
	80 (2.3920)				0.8024 (1.5896)		
	75						
	70 (1.177)		0.2722 (0.8978)				
Spilling Water (㎥/s)	85						
	80				3.6		
	75						
	70		8.9				
Months of Generat'n Stop	85						
	80				7		
	75						
	70		19				

Table 6-2-1(10) Reservoir Operation/Energy Porduction

L.W.L. = 60.61 ALPHA = 4

Item	Qf / NWL	50 m³/s	60 m³/s	70 m³/s	80 m³/s	90 m³/s	100 m³/s
Energy (GWh) U : Dry M : Wet L : Total	85 LWL 60					167.85	
						219.79	
						387.64	
	80 LWL 61				146.63		
					211.82		
					358.44		
	80 LWL 60						
	70						
Power (MW) U:Dry/Ave M:Wet/Ave L:Max.	85 LWL 60					140.9	
						142.5	
						169.2	
	80 LWL 61				122.8		
					123.4		
					136.6		
	75						
	70						
Water Level (m) U : Min. L : Ave.	85 LWL 60					60.7	
						78.3	
	80 LWL 61				61.3		
					76.1		
	75						
	70						

TWL = 27.0m

Legend: U = Upper Column
M = Middle Column
L = Lower Column

Item	Qf / NWL	50 m³/s	60 m³/s	70 m³/s	80 m³/s	90 m³/s	100 m³/s
Power Discharge (10^9 m³)	85 LWL 60					0.5373 (2.7585)	
	80 LWL 61				0.5732 (1.8188)		
	75						
	70						
Spilling Water (m³/s)	85 LWL 60					4.7	
	80 LWL 61				7.3		
	75						
	70						
Months of Generat'n Stop	85 LWL 60					97.1% 12	
	80 LWL 61				98.8% 5		
	75						
	70						

Table 6-2-1(11) Reservoir Operation/Energy Porduction

L.W.L.= 60.61 ALPHA = 5

Item	Qf / NWL	50 ㎥/s	60 ㎥/s	70 ㎥/s	80 ㎥/s	90 ㎥/s	100 ㎥/s
Energy (GWh) U : Dry M : Wet L : Total	85 LWL 60					167.86	
						226.99	
						394.84	
	80 LWL 61				146.63		
					220.43		
					367.05		
	75						
	70						
Power (MW) U:Dry/Ave M:Wet/Ave L:Max.	85 LWL 60					176.2	
						178.18	
						211.5	
	80 LWL 61				153.5		
					154.2		
					170.7		
	75						
	70						
Water Level (m) U : Min. L : Ave.	85 LWL 60					60.7	
						78.3	
	80 LWL 61				61.3		
					76.1		
	75						
	70						

TWL = 27.0m

Legend: U = Upper Column
M = Middle Column
L = Lower Column

Item	Qf / NWL	50 ㎥/s	60 ㎥/s	70 ㎥/s	80 ㎥/s	90 ㎥/s	100 ㎥/s
Power Discharge (10^9 ㎥)	85 LWL 60					0.5373 (2.7585)	
	80 LWL 61				0.5732 (1.8188)		
	75						
	70						
Spilling Water (㎥/s)	85 LWL 60					3.0	
	80 LWL 61				5.0		
	75						
	70						
Months of Generatin Stop	85 LWL 60					11	
	80 LWL 61				5		
	75						
	70						

Table 8-1. Occurrence of Ten Days Interval with the Remaining Discharge Less than 85/100 CM

Irrigable Area	Water Release	Discharge Reserved	March 1-10	March 11-20	March 21-31	April 1-10	April 11-20	April 21-30	May 1-10	July 21-31	Aug. 11-20	Sep. 21-30
Case I	0 CMS	85 t/s	-	-	-	-	2/17	2/17	-	-	-	-
(46,800 ha)	0 CMS	100 t/s	-	-	3/16	2/17	3/17	2/16	-	-	-	-
Case II	0	85	-	-	2/16	2/17	3/17	2/16	1/17	-	-	-
(54,250 ha)	0	100	-	-	3/16	2/17	3/17	2/16	2/17	-	-	-
Case II	70	85	-	-	-	-	-	-	-	-	-	-
(54,250 ha)	70	100	-	-	-	-	-	1/16	-	-	-	-
Case II	80	85	-	-	-	-	-	-	-	-	-	-
(54,250 ha)	80	100	-	-	-	-	-	1/16	-	-	-	-
Case III	0	85	-	1/17	4/16	4/17	2/17	2/16	2/17	-	-	-
(78,826 ha)	0	100	-	1/17	4/16	4/17	3/17	3/16	3/17	1/17	1/17	1/17
Case III	70	85	-	-	-	-	1/17	1/17	1/17	-	-	-
(78,826 ha)	70	100	-	-	-	2/17	3/17	1/16	1/17	-	-	-
Case III	80	85	-	-	-	-	1/17	1/16	-	-	-	-
(78,826 ha)	80	100	-	-	-	1/17	1/17	1/16	-	-	-	-
Case IV	0	85	-	-	3/16	2/17	3/17	2/16	2/17	-	-	-
(65,326 ha)	0	100	-	1/17	3/16	2/17	3/17	3/16	3/17	-	-	-
Case IV	70	85	-	-	-	-	1/17	1/16	-	-	-	-
(65,326 ha)	70	100	-	-	-	-	1/17	1/16	-	-	-	-
Case IV	80	85	-	-	-	-	1/17	1/16	-	-	-	-
(65,326 ha)	80	100	-	-	-	-	1/17	1/16	-	-	-	-

Note: 1. 3/16: three times/16 years

2. Discharge data of Kelantan river is obtained at 18 years from 1967 to 1984 at Guillemard bridge. 16 years or 17 years are not included years with lack of data.

Table 8-1-1 Occurrence of Ten Days Interval with the Remaining Discharge Less than 85/100 CMS

(Unit: MCM)

Note: Figures in parenthesis show thoses revised roughly considering the water requirement by Kemasin-Semerak and the difference of river discharge between Gillmerd and Kemubu.

Case	Water Release	Discharge Reserved	Month	Period	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Case I	0 CMS	85 t/s	Mar.	1-10				n.a														
				11-20				n.a														
				21-31			51.70 (70.63)	n.a								n.a						
			Apr.	1-10				n.a														
				11-20			12.20 (31.29)	n.a													40.19 (55.14)	
				21-30			7.01 (23.06)	n.a		n.a											45.05 (57.17)	
Case I	0 CMS	100 t/s	Mar.	1-10				n.a														
				11-20				n.a														
				21-31			51.70 (70.63)	n.a								n.a			64.41 (82.61)	77.71 (86.30)		
			Apr.	1-10		53.77 (73.75)		n.a													47.60 (65.55)	
				11-20		51.26 (69.59)	12.20 (31.29)	n.a													40.19 (55.14)	
				21-30			7.01 (23.06)	n.a		n.a											45.05 (57.17)	
Case II	0 CMS	85 t/s	Mar.	1-10				n.a														
				11-20				n.a														
				21-31			39.09 (58.37)	n.a								n.a			52.33 (70.77)			
			Apr.	1-10		40.52 (61.08)		n.a													35.76 (53.93)	
				11-20		39.01 (57.87)	-0.51 (19.14)	n.a													27.98 (45.34)	
				21-30			-3.87 (12.46)	n.a		n.a											36.55 (48.84)	
			May	1-10			49.90 (57.73)			n.a												

Continue

Case	Water Release	Discharge Reserved	Month	Period	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Case II	70	85	Mar.	1-10																		
			or	11-20	No-occurrence																	
			Apr.	21-30 (31)																		
Case II	70	100	Apr.	1-10																		
				11-20																		
				21-30			54.70 (71.03)															
Case II	80	85	Mar.	1-10																		
			or	11-20	No-occurrence																	
			Apr.	21-30 (31)																		
Case II	80	100	Apr.	1-10																		
				11-20																		
				21-30			63.67 (79.67)															

Continue

Case	Water Release	Discharge Reserved	Month	Period	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Case II	0 CMS	100 t/s	Mar.	1-10				n.a														
				11-20				n.a											64.69 (73.95)			
				21-31			39.09 (58.37)	n.a								n.a			52.23 (70.77)	72.43 (80.95)		
			Apr.	1-10		40.52 (61.08)		n.a													35.76 (53.93)	
				11-20		39.01 (57.87)	-0.51 (19.14)	n.a													29.98 (45.34)	
				21-30			-3.87 (12.46)	n.a		n.a											36.52 (48.84)	
			May	1-10			49.90 (57.73)			n.a					74.51							
Case III	0 CMS	85 t/s	Mar.	1-10																		
				11-20																47.99 (56.98)		
				21-31			7.17 (25.96)	n.a								n.a			21.40 (66.45)	54.89 (63.47)	57.95 (74.22)	
			Apr.	1-10		6.98 (26.76)	48.17 (61.46)	n.a						34.79 (54.96)							5.79 (23.49)	
				11-20		8.01 (26.18)	-13.54 (32.68)	n.a													4.14 (19.13)	
				21-30			-15.50 (31.40)	n.a		n.a											15.03 (26.98)	
				1-10			21.02							45.72								
Case III	0 CMS	100 t/s	Mar.	1-10				n.a														
				11-20				n.a												47.98 (56.98)		
				21-31			7.17 (25.96)									n.a			21.40 (66.47)	54.89 (63.47)	57.95 (74.22)	
			Apr.	1-10		6.98 (26.76)	48.17 (61.46)	n.a						34.79 (54.96)							5.79 (23.49)	
				11-20		8.01 (26.18)	-13.54 (32.68)														4.14 (19.13)	
				21-30			-15.5 (31.40)								46.44 (75.22)						15.03 (26.98)	

Continue

Case	Water Release	Discharge Reserved	Month	Period	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Case III	0 CMS	100 t/s	May	1-10			21.02			n.a					45.72						66.13	
				11-20						n.a												
				21-30						n.a												
			Jul.	1-10					n.a	n.a		n.a										
				11-20					n.a													
				21-31			76.56 (77.78)		n.a				n.a									
			Aug.	1-10					n.a													
				11-20					n.a										70.98 (74.45)			
				21-31					n.a													
			Sep.	1-10																		
				11-20																		
				21-30															57.98 (74.73)			
Case III	70 CMS	85 t/s	Mar.	1-10				n.a														
				11-20				n.a														
				21-31				n.a								n.a						
			Apr.	1-10				n.a														
				11-20			24.16 (43.30)	n.a														
				21-30			27.17 (43.07)	n.a			n.a											
			May	1-10			67.83				n.a											
Case III	70 CMS	100 t/s	Mar.	1-10				n.a													55.32 (73.00)	
				11-20				n.a													57.40 (72.39)	
				21-31				n.a								n.a					69.24 (81.18)	
			Apr.	1-10		53.32 (73.36)		n.a														
				11-20		56.17 (73.43)	24.16 (43.30)	n.a														
				21-30			27.17 (43.07)	n.a			n.a											
			May	1-10			67.83				n.a											

Continue

No.5

Case	Water Release	Discharge REserved	Month	Petiod	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Caseiii	80 CMS	85 t/s	Apr	1- 10				n.a.														
				11-20			32.80 (51.94)	n.a.														
				21-30			35.81 (51.71)	n.a.		n.a.												
Caseiii	80 CMS	100 t/s	Apr	1-- 10				n.a.													63.96 (81.61)	
				11-20			32.80 (51.94)	n.a.													66.04 (81.04)	
				21-30			35.81 (51.71)	n.a.		n.a.											77.88 (89.83)	
Caselv	0 CMS	85 t/s	Mar	1--10				n.a.														
				11-20				n.a.														
				21-31			25.94 (44.67)	n.a.								n.a.			39.53 (57.54)	64.42 (73.08)		
			Apr	1- 10		26.70 (44.69)		n.a.													23.42 (41.07)	
				11-20		26.24 (44.57)	-13.76 (9.34)	n.a.													19.34 (34.29)	
				21-30			-15.21 (0.65)	n.a.		n.a.											27.68 (39.61)	
			May	1-10			38.00			n.a.				61.53								
CaseIV	0 CMS	100 t/s	Mar	1- 10				n.a.														
				11-20				n.a.												57.71 (66.79)		
				21-31			25.94 (44.67)	n.a.								n.a.			39.53 (57.54)	64.52 (73.08)		
			Apr	1-10		26.70 (44.69)		n.a.													23.42 (41.07)	
				11-20		26.24 (44.57)	-13.76 (9.34)	n.a.													19.34 (34.29)	

Continue

No.6

Case	Water Release	Discharge Reserved	Month	Period	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
CaseIV 0 CMS	100 t/s		Apr	21-30			-15.21 (0.65)	n.a.		n.a.					62.10 (77.15)						27.68 (39.61)	
(continue)			May	1-10			38.00	n.a.							61.53							
CaseIV 70 CMS	85t/s		Apr	1- 10				n.a.														
				11-20			43.08 (62.18)	n.a.														
				21-30			43.36 (59.22)	n.a.		n.a.												
CaseIV 70 CMS	100t/s		Apr	1- 10				n.a.														
				11-20			43-08 (62.18)	n.a.														
				21-30			43.36 (59.22)	n.a.		n.a.												
CaseIV 80 CMS	85t/s		Apr	1- 10				n.a.														
				11-20			51.72 (70.82)	n.a.														
				21-30			52.00 (67.89)	n.a.		n.a.												
CaseIV 80 CMS	100 t/s		Apr	1- 10				n.a.														
				11-20			51-72 (70.82)	n.a.														
				21-30			52.00 (67.89)	n.a.		n.a.												

Table 8-2. The Planted, Harvested and Damaged Area of Paddy for Main Season in Kelantan Province, 1970/71 to 1984/85

(unit: ha)

Year	Planted Area	Change in Planted Area		Harvested Area	Damaged Area	Causes of Damage					
		To Pre-ceeding Year	On the Basis of 1975			Flood	Pest	Diseas	Blast	Draught	Others
1970/71	68,670			67,128	1,452	1,257	132	-	2	-	61
1971/72	68,940	+ 270		66,734	2,206	1,939	78	-	-	34	155
1972/73	70,389	+ 1,449		68,070	2,319	1,888	164	-	-	-	267
1973/74	65,790	- 4,599		54,462	11,328	8,291	1,057	-	-	1,637	343
1974/75	70,286	+ 4,496	0	66,955	3,341	2,645	422	23	-	64	177
1975/76	66,459	- 3,827	- 3,827	64,825	1,634	78	322	-	-	1,181	53
1976/77	62,442	- 4,017	- 7,844	60,828	1,614	727	428	4	-	374	81
1977/78	69,106	+ 6,664	- 1,180	68,561	545	1	438	-	-	-	106
1978/79	64,470	- 4,636	- 5,816	63,639	831	8	445	-	10	304	64
1979/80	60,804	- 3,666	- 9,482	57,173	3,631	846	471	-	-	2,206	108
1980/81	59,605	- 1,199	-10,681	57,606	1,999	60	1,561	-	-	264	114
1981/82	43,602	-16,003	-26,787	34,890	8,712	451	918	24	-	7,319	-
1982/83	46,934	+ 3,332	-23,455	46,279	655	20	609	9	-	17	-
1983/84	24,951	-21,983	-45,438	18,788	6,163	4,630	680	-	-	-	853
1984/85	33,189	+ 8,238	-37,200	31,722	1,467	257	1,205	-	-	-	5

Source: Statistics of Paddy

Table 8-3. The Planted Area of Paddy by District for the Main Season

Year	Total Area (Kelantan)	Tumpat	Pasir Mas	Kota Bahru	Bachock	Pasir Puteh	Machang	Tanah Merah	Ulu Kelantan	K A D A Area	K A D A %
1970/71	68,670	8,505	17,435	9,285	10,445	12,236	5,783	4,905	555		
1971/72	68,940	8,539	17,476	11,693	9,978	12,571	4,941	2,948	793		
1972/73	70,389	8,465	16,889	14,483	9,978	12,085	4,941	2,835	714		
1973/74	65,790	7,189	14,657	14,459	9,573	12,369	4,941	1,863	741		
1974/75	70,286	7,898	16,257	15,048	8,884	12,369	5,868	3,210	754	(31,826)	45.3
1975/76	66,459	7,108	15,400	14,513	7,237	11,693	4,941	4,814	753	(28,022)	42.2
1976/77	62,442	4,759	11,040	14,738	7,375	11,713	5,796	6,267	753	(22,374)	35.8
1977/78	69,106	5,730	16,261	14,738	7,655	12,140	5,851	6,038	893	(25,955)	37.6
1978/79	64,470	5,468	16,156	14,653	4,973	11,965	5,208	5,393	654	(23,015)	35.7
1979/80	60,804	5,164	13,262	14,584	5,242	11,534	5,010	5,354	654	(20,960)	34.5
1980/81	59,605	5,557	12,809	13,897	4,943	11,534	4,664	5,375	826	(22,251)	37.3
1981/82	43,602	1,506	5,517	13,520	4,227	10,462	3,827	4,088	455	(16,275)	37.3
1982/83	46,934	2,317	11,607	11,498	4,061	9,850	5,717	1,251	633	(21,550)	45.9
1983/84	24,951	1,906	4,139	1,285	665	6,457	4,275	1,505	367	4,091	16.4
1884/85	33,189	1,023	1,176	641	641	5,583	3,861	470	219	20,051	60.4
(A) Average 5 Year 1980/81 - 1984/85		2,462	7,050	8,168	2,907	8,777	4,469	2,538	400		
(B) Paddy Field Area Max.		8,539	17,476	15,048	10,445	12,571	5,868	6,267	893		
(C) Cropping Ratio A/B		29%	40%	54%	28%	70%	76%	40%	45%		

Table 8-4. The Planted Area of Paddy for Main Season by KADA Area and the Remaining Area

(unit: ha)

Year	Province	KADA Area		Remaining Area	
		Area	%	Area	%
1974/75	70,286	31,826	45.3	38,460	54.7
1975/76	66,459	28,022	42.2	38,437	57.8
1976/77	62,442	22,374	35.8	40,068	64.2
1977/78	69,106	25,955	37.6	43,151	62.4
1978/79	64,470	23,015	35.7	41,455	64.3
1979/80	60,804	20,960	34.5	39,844	65.5
1980/81	59,605	22,251	37.3	37,354	62.7
1981/82	43,602	16,275	37.3	27,327	62.7
1982/83	46,934	21,550	45.9	25,384	54.1
1983/84	24,951	4,091	16.4	20,860	83.6
1984/85	33,189	20,051	60.4	13,138	39.6

Table 8-5. The Reduction of Planted Area of Paddy for Main Season in Comparison with that in the Previous Year

(unit: ha)

Year	Province	KADA Area	Remaining Area
1974/75			
1975/76	-3,827	-3,804	- 23
1976/77	-4,017	-5,648	+1,631
1977/78	+6,664	+3,581	+3,083
1978/79	-4,636	-2,940	-1,696
1979/80	-3,666	-2,055	-1,611
1980/81	-1,199	+1,291	-2,490
1981/82	-16,003	-5,976	-10,027
1982/83	+3,332	+5,275	-1,943
1983/84	-21,983	-17,459	-4,524
1984/85	+8,238	+15,960	-7,722

Table 8-6. The Draught Area by District for Main Season

(unit: ha)

Year	Draught Total	Tumpat	Pasir Mas	Kota Baharu	Bachock	Pasir Puteh	Machang	Tanah Merah	Ulu Kelantan	KDADA
1970/71	-	-	-	-	-	-	-	-	-	-
1971/72	34	34	-	-	-	-	-	-	-	-
1972/73	-	-	-	-	-	-	-	-	-	-
1973/74	1,637	-	1,637	-	-	-	-	-	-	-
1974/75	64	-	-	64	-	-	-	-	-	-
1975/76	1,181	4	531	237	43	255	109	-	-	-
1976/77	374	59	115	4	46	93	-	57	-	-
1977/78	-	-	-	-	-	-	-	-	-	-
1978/79	304	37	-	-	67	197	3	-	-	-
1979/80	2,206	466	668	41	405	267	112	242	5	-
1980/81	264	-	-	-	210	32	20	-	2	-
1981/82	7,319	351	1,531	548	451	3,985	-	234	15	-
1982/83	17	-	7	-	10	-	-	-	-	-
1883/84	-	-	-	-	-	-	-	-	-	-
1984/85	-	-	-	-	-	-	-	-	-	-

Table 8-7. The Planted, Harvested and Damaged Area of Paddy for Off Season in Kelantan Province, 1972 to 1985

(unit: ha)

Year	Planted Area	Change in Planted Area		Harvested Area	Damaged Area	Causes of Damage					
		To Preceeding Year	On the Basis of 1975			Flood	Pest	Diseas	Blast	Draught	Others
1971	n.a			n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
1972	17,283			17,195	88	-	38	19	-	8	23
1973	21,033	+ 3,750		20,011	1,022	-	1,006	-	-	-	16
1974	23,139	+ 2,106		22,655	484	-	484	-	-	-	-
1975	27,338	+ 4,199	0	26,691	646	-	636	-	-	-	10
1976	24,184	- 3,154	- 3,154	23,745	439	334	75	-	-	11	19
1977	27,462	+ 3,278	+ 124	27,250	212	-	183	-	-	-	29
1978	26,571	- 891	- 767	26,308	263	-	186	-	-	-	77
1979	27,037	+ 466	- 301	26,125	912	534	287	-	-	36	55
1980	19,390	- 7,648	- 7,948	19,125	265	-	191	6	-	45	23
1981	21,870	+ 2,480	- 5,468	20,261	1,609	941	593	-	-	13	62
1982	20,921	- 949	- 6,417	20,572	349	14	196	10	-	129	-
1983	19,407	- 1,514	- 7,931	19,086	321	121	190	-	-	10	-
1984	25,559	+ 6,152	- 1,779	25,070	489	-	365	14	-	110	-
1985	24,412	- 1,147	- 2,926	24,318	94	-	71	20	-	-	3

Table 8-8. The Planted Area of Paddy by District for the Off Season

Year	Total Area (Kelantan)	Tumpat	Pasir Mas	Kota Bahru	Bachock	Pasir Puteh	Machang	Tanah Merah	Ulu Kelantan	K A D A Area	K A D A %
1972	17,283	1,421	3,173	8,809	2,147	1,357	61	315	555		
1973	21,033	936	4,673	11,543	2,971	770	72	69	793		
1974	23,139	1,361	4,363	11,654	2,991	2,309	73	389	714		
1975	27,338	2,420	5,482	12,218	4,493	1,944	182	452	741	(22,293)	81.5
1976	24,184	3,401	5,482	12,277	1,924	235	156	608	754	(21,655)	89.5
1977	27,462	3,605	5,570	11,713	4,433	1,094	165	693	753	(25,434)	92.6
1978	26,571	3,422	5,628	11,729	3,296	1,478	157	822	754	(25,692)	96.7
1979	27,037	3,507	4,153	11,741	4,618	1,559	138	1,096	893	(21,322)	78.9
1980	19,390	870	1,843	11,060	2,734	1,676	89	1,118	654	(21,442)	110.6
1981	21,870	963	5,418	9,750	2,929	1,595	89	1,114	654	(18,993)	86.8
1982	20,921	1,195	4,417	10,150	4,195	621	132	211	-	(17,965)	85.9
1983	19,407	2,288	4,518	8,965	2,845	785	-	6	-	(18,721)	96.5
1984	25,559	280	1,175	-	530	217	818	383	20	22,136	86.6
1985	24,412	480	904	325	308	-	880	292	-	21,182	86.8
(A) Average 5 Year 1980/81 - 1984/85		1,041	3,286	5,838	2,161	644	384	401	135		
(B) Paddy Field Area		8,539	17,476	15,048	10,445	12,571	5,868	6,267	893		
(C) Cropping Ratio		12%	19%	39%	21%	5%	7%	6%	15%		

Table 8-9. The Cropped Area of Paddy per Year in KADA

Sub Area	Kemubu/Salor		Lemal/Alor Pssir		Pasir Mas:		Total	
Paddy Field	21,855		9,605		2,195		33,655	
	Cropped	%	Cropped	%	Cropped	%	Cropped	%
1974/75	36,455	167	13,918	145	3,746	171	54,119	161
1975/76	34,027	156	11,904	124	3,745	171	49,676	148
1976/77	36,819	168	7,468	78	3,521	160	47,808	142
1977/78	35,989	165	11,936	124	3,723	170	51,648	153
1978/79	34,273	157	6,633	69	3,435	156	44,341	132
1979/80	32,232	147	7,195	75	2,975	136	42,402	126
1980/81	29,810	136	9,056	94	2,408	110	41,274	123
1981/82	26,800	123	5,832	61	1,608	73	34,240	102
1982/83	27,565	126	10,010	104	2,696	123	40,271	120
1983/84	16,284	75	7,335	76	2,608	119	26,227	78

Note: The cropped area are those of both season of main and off. Figures of percentage show the crop intensity of annual cropped area divided by the paddy field of Sub Area.

Source: Statistical Digest, KADA

Table 8-10. The Cropped Area of Paddy for Both Season in KADA

(unit: ha, %)

Sub-Area	Kemubu/Salor		Lemal/ Alor Pasir		Pasir Mas		Total	
Paddy Field	21,855		9,605		2,195		33,655	
	Cropped	%	Cropped	%	Cropped	%	Cropped	%
Main Season								
1974/75	19,866	90.9	9,872	102.8	2,087	95.1	31,826	94.6
1975/76	19,866	90.9	6,069	63.2	2,087	95.1	28,022	83.3
1976/77	18,976	86.8	1,618	16.8	1,780	81.1	22,374	66.5
1977/78	18,065	82.7	5,907	61.5	1,983	90.3	25,955	77.1
1978/79	18,045	82.6	3,194	33.3	1,776	80.9	23,015	68.4
1979/80	17,398	79.6	2,024	21.1	1,539	70.1	20,960	62.3
1980/81	16,807	76.9	4,108	42.8	1,366	62.2	22,251	66.1
1981/82	12,905	59.0	2,160	22.5	1,210	55.1	16,275	48.4
1982/83	14,970	68.5	5,248	54.6	1,332	60.7	21,550	64.0
1983/84	2,266	10.4	837	8.7	988	45.0	4,091	12.2
Off Season								
1975	16,589	83.7	4,046	42.3	1,659	79.4	22,293	70.8
1976	14,161	71.4	5,835	61.0	1,658	79.3	21,655	68.8
1977	17,843	90.0	5,850	61.1	1,741	83.3	25,434	80.8
1978	17,924	90.4	6,029	63.0	1,740	83.3	25,692	81.6
1979	16,228	81.9	3,439	35.9	1,659	79.4	21,322	67.7
1980	14,834	74.8	5,171	54.0	1,436	68.7	21,442	68.1
1981	13,003	65.6	4,948	51.7	1,042	49.9	18,993	60.3
1982	13,895	70.1	3,672	38.4	398	19.0	17,965	57.1
1983	12,595	63.5	4,762	49.8	1,364	65.3	18,721	59.5
1984	14,018	70.7	6,498	67.9	1,620	77.5	22,136	70.3

Note : Figures of percentage show the crop intensity of annual cropped area divided by the paddy field of Sub Area.

Source: Statistical Digest, KADA

Table 8-11. Basic Data for the Correlation Study between Paddy Yield and Rainfall/Pumping Discharge by Growing Stage of Paddy - Kemubu/Salor Area

Year	Month	Rainfall (mm)	Discharge (10^6t)	Dates of Growing Stage	Paddy Yield (t/ha)
	Jan.	44.1	35.11		
	Feb.	25.1	35.40		
	Mar.	17.5	24.43		
	Apr.	95.1	0.01		
	May	158.3	33.98	SW-7, SEE-17	
1980	Jun.	136.2	34.21	TP-12, RS	
	Jul.	223.5	36.26		
	Aug.	268.5	57.54	PS-5, BS-29	
	Sep.	218.5	13.79	STW-20	
	Oct.	256.0	0.38	HV-5	4.15
	Nov.	375.5	8.54	SW-2, SEE-12	
	Dec.	752.0	7.09	TP-7, RS	
	Jan.	24.5	31.03	PS-26	
	Feb.	52.5	25.21	BS-19	
	Mar.	22.1	33.58	STW-10 HV-26	2.92
	Apr.	82.5	11.40		
	May	275.5	9.54	SW-7 SEE-17	
1981	Jun.	105.8	22.67	TP-17, RS	
	Jul.	128.0	37.76	PS-22	
	Aug.	35.3	34.89	BS-15	
	Sep.	126.8	19.25	STW-7 HV-22	2.69
	Oct.	164.0	7.40	SW-22	
	Nov.	429.0	13.45	SEE-2, TP-27	
	Dec.	845.5	13.43	RS	
	Jan.	25.0	28.17	PS-26	
	Feb.	17.6	24.62	BS-19, STW-25	
	Mar.	50.0	18.42	HV-26	2.44
	Apr.	40.4	9.91	SW-16, SEE-26	
	May	100.5	29.83	TP-21, RS	
1982	Jun.	153.6	29.82	PS-16	
	Jul.	330.1	20.70	BS-12	
	Aug.	237.1	30.94	STW-19	
	Sep.	233.5	16.73	HV-18	3.62
	Oct.	242.9	9.73		
	Nov.	325.9	13.27	SW-20, SEE-30	
	Dec.	626.1	12.96	TP-25, RS	
	Jan.	86.6	37.51		
	Feb.	10.5	37.84	PS-30	
	Mar.	96.8	41.22	BS-23, STW-31	
	Apr.	51.7	9.43	HV-30	3.32
	May	62.4	15.64	SW-25	
1983	Jun.	142.5	39.33	SEE-5, TP-30	
	Jul.	306.0	34.08	RS	
	Aug.	203.5	39.61	PS-7	
	Sep.	244.9	26.05	BS-1	
	Oct.	176.0	16.56	STW-7, HV-27	4.04
	Nov.	331.5	2.07	non main season crop	
	Dec.	1,303.5	0.07	due to heavy flood	

Note: SW : Start of water supply SEE: Start of seeding nursery
TP : Start of transplanting RS : Rooting stage
PS : Panicle stage BS : Booting stage
STW: Stop of water supply HV : Harvesting

Source: KADA office

Table 8-12. Paddy Yield and Growth Rate - Kelantan

Year	Main Season Paddy Yield (t/ha)	Year	Off Season Paddy Yield (t/ha)
1975/76	1.972	1976	2.680
1976/77	2.432	1977	2.895
1977/78	2.510	1978	2.779
1978/79	2.368	1979	2.713
1979/80	2.508	1980	3.114
1980/81	2.478	1981	2.817
1981/82	2.161	1982	3.422
1982/83	2.357	1983	3.341
1983/84	2.221	1984	2.870
1984/85	2.783	1985	3.026
Average	2.384	Average	2.966

Note: $y = 2.232 + 0.026x$ $y = 2.713 + 0.046x$

$GR = \frac{0.026}{2.232} = 0.0116 = 1.2\%$ $GR = \frac{0.046}{2.713} = 0.01695 = 1.7\%$

Source: SEPU

Table 8-13. Paddy Yield and Growth Rate-Kelantan

Year	Main Season Paddy Yield (t/ha)	Year	Off Season Paddy Yield (t/ha)
1970	2.180	1970	2.662
1971	2.302	1971	2.795
1972	1.954	1972	2.936
1973	2.267	1973	2.475
1974	2.224	1974	2.852
1975	1.847	1975	2.567
1976	1.973	1976	2.681
1977	2.429	1977	2.896
1978	2.511	1978	2.780
1979	2.369	1979	2.715
1980	2.509	1980	3.114
Average	2.233	Average	2.770

Note: $y = 2,349 + 0.0444x$ $y = 2.653 + 0.0195x$

$GR = \frac{0.044}{2.349} = 1.9\%$ $GR = \frac{0.0195}{2.653} = 0.7\%$

Table 8-14. Paddy Yield for Main Season

(unit: tons/ha harvested)

	District	At Present (1985)	1998/1999 (14 yr th)	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Inside irrigation scheme (irrigated)	Kota Bharu	2.71	3.20	3.24	3.28	3.32	3.36	3.40	3.44	3.48	3.52	3.56	3.60	3.64	3.68	3.73	3.76	3.76	3.76	3.76	3.76	3.76
	Pasir Mas	2.93	3.46	3.50	3.54	3.59	3.63	3.67	3.72	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76
	Pasir Puteh	2.79	3.30	3.34	3.38	3.42	3.46	3.50	3.54	3.59	3.63	3.68	3.72	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76
	Tempat	2.96	3.50	3.54	3.58	3.63	3.67	3.72	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76
	Bachoh	2.71	3.20	3.24	3.28	3.32	3.36	3.40	3.44	3.48	3.52	3.56	3.60	3.64	3.68	3.73	3.76	3.76	3.76	3.76	3.76	3.76
	Machang	2.79	3.30	3.34	3.38	3.42	3.46	3.50	3.54	3.59	3.63	3.68	3.72	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76
	Tanah Merah	2.83	3.35	3.39	3.43	3.47	3.51	3.56	3.60	3.64	3.68	3.73	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76	3.76
Outside irrigation scheme (Rainfed)	Kota Bharu	2.28	2.69	2.72	2.75	2.79	2.82	2.86	2.89	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92
	Pasir Mas	1.74	2.06	2.08	2.11	2.14	2.16	2.19	2.21	2.24	2.27	2.29	2.32	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35
	Pasir Puteh	2.14	2.53	2.56	2.59	2.62	2.65	2.69	2.72	2.75	2.78	2.82	2.85	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88	2.88
	Tempat	2.13	2.52	2.55	2.58	2.61	2.64	2.67	2.71	2.74	2.77	2.81	2.84	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87
	Bachoh	2.01	2.38	2.41	2.44	2.47	2.50	2.53	2.56	2.59	2.62	2.65	2.68	2.72	2.72	2.72	2.72	2.72	2.72	2.72	2.72	2.72
	Machang	2.36	2.79	2.82	2.86	2.89	2.93	2.96	3.00	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03
	Tanah Merah	2.43	2.87	2.90	2.94	2.97	3.01	3.05	3.08	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12

Note: 1) Annual growth ratio is estimated at 1.2 percent using the production of paddy harvested from 1975/76 to 1984/85 sourced from the data of Kelantan Province (SEPU).

2) Paddy yield at present is calculated on yield by the district from 1978/79 to 1984/85 sourced from the SEPU.

3) Figures are yield with harvested area of paddy.

Table 8-15. Paddy Yield for Off Season

(unit: tons/ha harvested)

	District	At Present (1985)	1999 (14th)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	Kota Bharu	3.11	3.43	3.45	3.48	3.50	3.53	3.55	3.58	3.60	3.63	3.65	3.68	3.70	3.73	3.75	3.78	3.80	3.83	3.86	3.89	3.91
Inside	Pasir Mas	2.90	3.20	3.22	3.24	3.27	3.29	3.31	3.34	3.36	3.38	3.41	3.43	3.46	3.48	3.51	3.53	3.56	3.58	3.61	3.63	3.66
irrigation	Pasir Puteh	2.82	3.11	3.13	3.15	3.18	3.20	3.22	3.24	3.27	3.29	3.32	3.34	3.36	3.38	3.41	3.43	3.46	3.43	3.50	3.53	3.55
scheme	Tempat	3.36	3.71	3.74	3.76	3.79	3.81	3.84	3.87	3.90	3.93	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95
(irrigated)	Bachoh	2.99	3.30	3.32	3.35	3.37	3.39	3.42	3.44	3.47	3.49	3.52	3.54	3.57	3.59	3.62	3.65	3.67	3.70	3.72	3.75	3.77
	Machang	3.27	3.61	3.64	3.66	3.69	3.71	3.74	3.76	3.79	3.82	3.84	3.87	3.90	3.93	3.95	3.95	3.95	3.95	3.95	3.95	3.95
	Tanah Merah	-																				
	Kota Bharu	2.79	3.08	3.10	3.12	3.15	3.17	3.19	3.21	3.23	3.25	3.28	3.32	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.34
	Pasir Mass	2.66	2.93	2.95	2.97	2.99	3.01	3.03	3.06	3.08	3.10	3.12	3.15	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17
Outside	Pasir Puteh	2.64	2.91	2.93	2.95	2.97	2.99	3.01	3.03	3.06	3.08	3.10	3.12	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
irrigation	Tempat	3.11	3.43	3.45	3.48	3.50	3.53	3.55	3.58	3.60	3.63	3.65	3.68	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70
scheme	Bachoh	2.66	2.93	2.95	2.97	2.99	3.01	3.06	3.06	3.08	3.10	3.12	3.15	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17	3.17
(Rainfed)	Machang	2.87	3.17	3.19	3.21	3.24	3.26	3.28	3.31	3.33	3.35	3.38	3.40	3.42	3.42	3.42	3.42	3.42	3.42	3.42	3.42	3.42
	Tanah Merah	2.63	2.90	2.92	2.94	2.96	2.98	3.00	3.02	3.05	3.07	3.09	3.11	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14

Note: 1) Annual growth ratio is estimated at 0.7 percent using the production of paddy harvested from 1970 to 1980 sourced from the data of Kelantan Province (Department of Agricultural, Agricultural Basic Statistics).

2) Paddy yield at present is calculated on yield by the district from 1978/79 to 1984/85 sourced from the SEPU.

Table 8-16. Price Structure for Rice

Item	1986		1995		2000	
	Financial	Economic	Financial	Economic	Financial	Economic
US$/mt						
1. Export price of Thai 5% brokens, FOB. Bangkok 1/	177	177	212	212	216	216
2. Grade difference (less 10%) 2/	-18	-18	-21	-21	-21	-21
3. Ocean freight and insurance 3/	+30	+30	+30	+30	+30	+30
4. C.i.f. price, Port Klang M$/mt (US$1 = M$2.50) 4/	189	189	221	221	225	225
5. C.i.f. price, Port Klang	473	473	553	553	563	563
6. Port handling 5/	+30	+22	+30	+22	+30	+22
7. Transport cost, Port Klang to Kota Bharu 6/	+140	+92	+140	+92	+140	+92
8. Wholesale price, Kota Bharu	643	587	723	667	733	677
9. Transport cost, KADA area to K.B.	-5	-4	-5	-4	-5	-4
10. Ex-mill price, KADA area	638	583	718	663	728	673
11. Paddy equivalent, KADA area 7/	415	379	467	431	473	437
12. Milling Cost 8/	-49	-44	-49	-44	-49	-44
13. Farm-gate price 9/	366	335	418	387	424	393

Note: 1/ Macro and Financial Assumption and Half-Yearly Revision of Commodity Price Forecasts, World Bank Memorandum Feb. 5, 1987.

2/ The grades producted in the projected area close in equality to 15% broken Thai rice According to W.B. data. Then the quality adjustment is reduced 10%.

3/ Based on the Kemasin-Semerah Integrated Rural Development Project Phase II, Economic Reevaluation of Project, 1986.

4/ Exchange rate is based on the rates which Consultants collected during the field survey.

5/ The charge is based on the Kemasin-Semerak Report, 1986.

6/ The transport cost is based on the Kemasin-Semerak Report, 1986.

7/ The rate of recovery is 65% based on the information from LPN, PERINGAT.

8/ The milling cost is based on the Kemasin-Semerak Report, 1986.
A conversion factor of 0.89 applied for port handling.

9/ Actual farm gate price of rice is 0.58 m$/kg in 1986.
The converted price of paddy is 0.377 m$/kg.

Table 8-17. Production Cost of Paddy per ha. (traditional)
- Market Price -

(unit: M$)

Item	Materials	Family labor Labor day	Family labor Wage	Total Cost
1. Preparation of nursery	-	5	45.00	45.00
2. Seed 1/	20.00	1	9.00	29.00
3. Plowing (contract)	-	-	-	200.00
4. Transplanting (contract)	-	-	-	225.00
5. Fertilizing 2/	170.00	3	27.00	197.00
6. Pestciding & weeding 3/	134.00	7	63.00	197.00
7. Harvesting (contract)	-	-	-	330.00
8. Others 4/	-	-	-	74.00
Total	338.00	16	144.00	1,297.00

Note:
1/ Seed: 25 kg x $0.75 = $18.75 ≒ $20.00
2/ Fertilizer: Amophos 10 kg/ha
N 80 kg/ha
P_2O_5 30 kg/ha
K_2O 20 kg/ha
3/ Chemical (to be altered)
Furadan 3G 10 kg
Rumputox 2.2 kg
Sumidan 49.4 kg
4/ Transportation from paddy field to mill.

Source: KADA

Table 8-18. Production Cost of Paddy per ha. (traditional)
- Economic/Accounting Price -

(unit: M$)

Item	Materials	Family labor Labor day	Family labor Wage	Total Cost
1. Preparation of nursery	-	5	27	27
2. Seed	17	1	6	23
3. Plowing (contract)	-	-	-	172
4. Transplanting (contract)	-	-	-	135
5. Fertilizing	146	3	16	162
6. Pestciding & weeding	115	7	38	153
7. Harvesting (contract)	-	-	-	198
8. Others	-	-	-	64
Total	278	16	87	934

Note: Conversion factor for agricultural inputs in 0.86.
Shadow rate of unskilled labor's wage in 0.6.

Table 8-19. Production Cost of Paddy per ha (direct seeding)
- Market Price -

(unit: M$)

Item	Materials	Family labor		Total Cost
		Labor day	Wage	
Land preparation	250	2	18	268
Seed 1/	30	-	-	30
Broadcasting		3	27	27
Pesticide & weeking	140	11	99	239
Fertilizing 2/	200	2	18	218
Harvesting (contract)	-	-	-	300
Others	-	-	-	54
Total	620	18	162	1,136

Note: 1/ Seeds 40 kg x 0.75$ = $30
2/ Fertilizer: N = 100 kg, P_2O_5 = 40 kg, K_2O = 30 kg

Source: KADA

Table 8-20. Production Cost of Paddy per ha. (direct seeding)
- Economic/Accounting Price -

(unit: M$)

Item	Materials	Family labor		Total Cost
		Labor day	Wage	
Land preparation	215	2	11	226
Seed	26	-	-	26
Broadcasting	-	3	16	16
Pesticide & weeking	120	11	59	179
Fertilizing	172	2	11	183
Harvesting (contract)	-	-	-	180
Others	-	-	-	46
Total	533	18	97	856

Note: Conversion factor for agricultural inputs in 0.86.
Shadow rate of unskilled labor's wage in 0.6.

Table 8-20-1 Production Cost of Maize per ha.
-Market Price- Unit:M$

Item	Materials	Family Labor		Total Cost
		Labor days	Wage	
1.Land preparation(contract)	-	-	-	250
2.Lime 1/	83	5	45	128
3.Seeds 2/	-	8	72	72
4.Seeding	200	-	-	200
5.Fertilizer3/	227	8	72	299
6.Weeding 4/	58	10	90	148
7.Pest control	60	10	90	150
8.Harvesting	-	10	90	90
Total	628	51	459	1,337

Note: 1/ 2.5 MT 3times
2/ Seeds 20 kg
3/ Urea 220 kg Triple Superhosphate 130 kg
Muriate of potash 70 kg
4/ Herbicide Mixed paraquart 1.6 kg,Atragine 2.5 kg

Table 8-20-2 Production Cost Of Maize per ha.
-Economic Price_ Unit:M$

Item	Materials	Family Labor		Total Cost
		Labor days	Wage	
1.Land preparation	-	-	-	215
2.Line	71	5	27	98
3.Seeds	-	8	43	43
4.Seedling	172	-	-	172
5.Fertilizer	195	8	43	238
6.Weeding	50	10	54	104
7.Pest Control	52	10	54	106
8.Harvesting	-	10	54	54
Total	540	51	275	815

Table 8-20-3 Production Cost of Ground nuts per ha.
-Maket Price- Unit:M$

Item	Materials	Family Labor		Total Cost
		Labor days	Wage	
1.Land preparation(contract)	-	-	-	250
2.Seeding	-	17	153	153
3.Seeds 1/	200	-	-	200
4.Fertilizer 2/	293	10	90	383
5.Pest control	65	7	63	128
6.Weeding 3/	105	20	180	289
7.Harvesting	-	47	423	423
Total	667	101	909	1,826

Note; 1/ Seeds 100 kg
2/ Fertilizer: Sulphate of Amonia 162 kg,Tripule Superphosphate 122 kg,Muriete of Potash 93 kg Kapor 1MT
3/ Herbicide: Lasso 4.6 liter

Table 8-20-4 Production Cost of Ground Nuts per ha.
-Economic Price - Unit:M$

Item	Materials	Family Labor		Total Cost
		Labor days	Wage	
1.Land preparation(contract)	-	-	-	215
2.Seedling	-	17	92	92
3.Seeds	172	-	-	172
4.Fertilizer	252	10	54	306
5.Pest Control	56	7	38	94
6.Weeding	90	20	108	198
7.Harvesting	-	47	254	254
Total	570	101	546	1,331

Table 8-20-5 Production Cost of Tobacco per ha.
-Market Price - Unit:M$

Item	Materials	Family Labor		Total Cost
		Labor days	Wage	
1.Nursery bed	39	18	162	201
2.Mengerek	49	94	846	895
3.Plastik	108	-	-	108
4.Land preparation	34	-	-	34
5.Planting	-	104	936	936
6.Watering	-	15	135	135
7.Fertilizer 1/	350	12	108	458
8.Pest control	244	15	135	379
9.Weeding	-	32	288	288
10.Mengasi	-	20	180	180
11.Harvest	-	37	333	333
10.Other	100	-	-	100
Total	924	347	3,123	4,047

Note: 1/ N= 20 kg/ha, p_2O_5=168 kg/ha, k_2O=134 kg/ha
MgO=27 kg/ha, B=3.5 kg/ha

Table 8-20-6 Production Cost of Tobacco per ha.
- Economic Price - unit: M$

Item	Materials	Family Labor		Total Cost
		Labor days	Wage	
1.Nursery bed	34	18	97	131
2.Mengerek	42	94	508	550
3.Plastik	93	-	-	93
4.Land preparation	29	-	-	29
5.Planting	-	104	562	562
6.Watering	-	15	81	81
7.Fertilizing	301	12	65	366
8.Pest control	210	15	81	291
9'Weeding	-	32	173	173
10.Mengasi	-	20	108	108
11.Harvest	-	37	200	200
12.Other	86	-	-	86
Total	795	347	1,875	2,670

Table 8-20-7 Production Cost of Sorghum per ha.
-Maket Price - Unit: M$

Item	Materials	Family Labor		Total COst
		Labor days	Wage	
1.Land preparation	-	-	-	250
2.Liming	42	3	27	69
3.Seedling	112	10	90	202
4.Fertilizer	339	8	72	411
5.Pest control	60	5	45	105
6.Weeding	58	3	27	85
7. Harvesting	-	10	90	90
Total	611	39	351	1,212

Table 8-20-8 Production Cost of Sorghum per ha.
-Economic Price - Unit:M$

Item	Materials	Family Labor		Total COst
		Labor days	Wage	
1.Land Preparation	-	-	-	215
2.Liming	36	3	16	52
3.Seedling	96	10	54	150
4.Fertilizer	292	8	43	335
5.Pest control	52	5	27	79
6.Weeding	50	3	16	66
7.Harvesting	-	10	54	54
Total	526	39	210	951

Table 8-20-9 Production Cost of Cabbage per ha.
-Economic Price - Unit:M$

Item	Material	Family Labor		Total Cost
		Labor days	Wage	
1.Land preparation	-	40	360	360
2.Nursery bed	-	12	108	108
3.Seed 1/	90	-	-	90
4.Mengubah anak benih	-	25	225	225
5.Watering	-	12	108	108
6.Fertilizing (6x)2/	2,137	17	153	2,290
7.Pest control	937	40	360	1,295
8.Weeding	-	7	63	63
9.Mengganti pokok mati	-	7	63	63
10.Harvesting and prepare for selling	-	10	90	90
Total	3,162	170	1,530	4,692

Note: 1/ 0.2 kg x M$ 90/200gm =M$ 90

2/ Humus 5MT x M$ 100/MT
Nitrophoska Blue Special 2MT x M$ 800/MT ,Urea 80kg x M$ 460/MT

Table 8-20-10 Production Cost of Cabbage per ha.

- Economic Price - unit:M$

Item	Materials	Family Labor		Total Cost
		Labor day	Wage	
1.Land preparation	-	40	216	216
2.Nursery bed	-	12	65	65
3.Seed	77	-	-	77
4.Mengubah anak benih	-	25	135	135
5.Watering	-	12	65	65
6.Fertilizing	1,838	17	92	1,930
7.Pest control	804	40	216	1,020
8.Weeding	-	7	38	38
9.Mengganti pekok mati	-	7	38	38
10.Harvesting & prepare for selling	-	10	54	54
Total	2,719	170	919	3,638

Note:Conversion factor for agricultural inputs is 0.86.
Shadow rate of unskilled labor's wage is M$9 x 0.6 =M$5.4
Production costs mentioned above tables are estimated using these rates.

Table 8-21 Case - 5 Cropping Area With Project --- Paddy

(unit:ha)

Main Season	1998/99	99/2000	2000/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Kemubu	693	693	693	693	693	693	693	693	693	693	693	693	693	693
Lemal & Pasir M.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	693	693	693	693	693	693	693	693	693	693	693	693	693	693
North Lemal	-	2,915	2,915	3,280	3,280	3,280	3,280	3,280	3,280	3,280	3,280	3,280	3,280	3,280
Ulu Lemal	-	3,045	3,045	3,425	3,425	3,425	3,425	3,425	3,425	3,425	3,425	3,425	3,425	3,425
Sg.Bagan	-	1,296	1,296	1,458	1,458	1,458	1,458	1,458	1,458	1,458	1,458	1,458	1,458	1,458
Tase Garu	-	-	-	-	-	-	-	-	14,920	14,920	16,785	16,785	16,785	16,785
Sg.Sat	-	-	-	-	-	-	-	-	-	-	1,458	1,458	1,640	1,640
Panyit	-	-	-	-	-	-	-	-	-	-	987	987	1,110	1,110
Kusial	-	-	-	-	-	-	-	-	-	-	1,000	1,000	1,125	1,125
Total	693	7,949	7,949	8,856	8,856	8,856	8,856	8,856	23,776	29,086	29,086	29,086	29,516	29,516

Off Season	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Kemubu	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Lemal & Pasir M.	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540
Sus-total	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575	1,575
North Lemal	-	-	-	341	341	341	341	341	341	341	341	341	341	341
Ulu Lemal	-	-	-	341	341	341	341	341	341	341	341	341	341	341
Sg.Bagan	-	-	-	134	134	134	134	134	134	134	134	134	134	134
Tase Garu	-	-	-	-	-	-	-	3,374	5,239	5,239	7,104	7,104	7,104	7,104
Sg.Sat	-	-	-	-	-	-	-	-	-	-	144	326	326	507
Panyit	-	-	-	-	-	-	-	-	-	-	104	227	227	350
Kusial	-	-	-	-	-	-	-	-	-	-	750	875	875	1,000
Total	1,575	1,575	1,575	2,391	2,391	2,391	2,391	5,765	7,630	7,630	10,493	10,923	10,923	11,352
Grand Total	2,268	9,524	9,524	11,247	11,247	11,247	11,247	14,621	31,406	31,406	39,579	40,009	40,439	40,868

Table 8-22. Case 5 Cropping Area without Project --- Paddy

(unit: ha)

Main Season	1998/99	99/2000	2000/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Kemubu	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lemal & Pasir M.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North Lemal	-	1,057	1,057	1,057	1,057	1,057	1,057	1,057	1,057	1,057	1,057	1,057	1,057	1,057
Uln Lemal	-	1,522	1,522	1,522	1,522	1,522	1,522	1,522	1,522	1,522	1,522	1,522	1,522	1,522
Sg. Bagan	-	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231
Tase. Garu	-	-	-	-	-	-	-	-	2,560	2,560	2,560	2,560	2,560	2,560
Sg. Sat	-	-	-	-	-	-	-	-	-	-	1,385	1,385	1,385	1,385
Panyit	-	-	-	-	-	-	-	-	-	-	938	938	938	938
Kusial	-	-	-	-	-	-	-	-	-	-	500	500	500	500
Total	-	3,810	3,810	3,810	3,810	3,810	3,810	3,810	6,370	6,370	9,193	9,193	9,193	9,193

Off Season	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Kemubu	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lemal & Pasir M.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North Lemal	437	437	437	437	437	437	437	437	437	437	437	437	437	437
Uln Lemal	654	654	654	654	654	654	654	654	654	654	654	654	654	654
Sg. Bagan	103	103	103	103	103	103	103	103	103	103	103	103	103	103
Tase. Garu	-	-	-	-	-	-	-	800	800	800	800	800	800	800
Sg. Sat	-	-	-	-	-	-	-	-	-	-	128	128	128	128
Panyit	-	-	-	-	-	-	-	-	-	-	86	86	86	86
Kusial	-	-	-	-	-	-	-	-	-	-	75	75	75	75
Total	1,194	1,194	1,194	1,194	1,194	1,194	1,194	1,994	1,994	1,994	2,283	2,283	2,283	2,283
Grand Total (ha)	1,194	5,004	5,004	5,004	5,004	5,004	5,004	5,804	8,364	8,364	11,476	11,476	11,476	11,476

Table 8-22-1 Case-5 Cropped Area of the Upland Crops

Unit:ha

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Without Project												
Maize	259	265	272	278	285	292	298	305	311	318	325	330
Groundnuts	340	340	340	340	340	340	340	340	340	340	340	340
Tobacco	1,393	1,423	1,450	1,479	1,507	1,535	1,565	1,593	1,621	1,649	1,677	1,708
Sorghum	-	-	-	-	-	-	-	-	-	-	-	-
Vegetable	292	292	292	292	292	292	292	292	292	292	292	292
Total	2,284	2,320	2,354	2,389	2,424	2,459	2,495	2,530	2,564	2,599	2,634	2,670
With Project												
Maize	816	821	823	827	830	834	837	1,501	1,503	1,505	1,508	1,511
Groundnuts	2,790	2,790	2,790	2,790	2,790	2,790	2,790	3,290	3,290	3,290	3,290	3,290
Tobacco	3,240	3,255	3,272	3,287	3,303	3,318	3,335	4,127	4,131	4,136	4,840	4,840
Sorghum	-	-	-	-	-	-	-	4,570	4,570	4,570	4,570	4,570
Vegetable	938	938	938	938	938	938	938	1,399	1,399	1,399	1,633	1,633
Total	7,784	7,803	7,823	7,842	7,861	7,880	7,900	14,887	14,893	14,900	15,841	15,844

Table 8-23 Case-1 Net Production Value (Unit: million M$)

- Market Price -

	*1999	*2000	*2001	*2002	*2003	*2004	*2005	*2006	*2007	*2008	*2009	*2010	*2011	*2012	*2013	*2014	*2015	*2016	*2017	*2018
With Project																				
G.P.V.	3.55	3.60	3.66	3.74	3.80	3.82	3.84	3.85	3.87	3.89	3.91	3.93	3.94	3.97	3.98	4.00	4.02	4.04	4.06	4.06
P.C.	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58
N.P.V.	0.97	1.02	1.08	1.16	1.22	1.24	1.26	1.27	1.29	1.31	1.33	1.35	1.36	1.39	1.40	1.42	1.44	1.46	1.48	1.48
Without Project																				
G.P.V.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P.C.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N.P.V.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Incremental N.P.V.	0.97	1.02	1.08	1.16	1.22	1.24	1.26	1.27	1.29	1.31	1.33	1.35	1.36	1.39	1.40	1.42	1.44	1.46	1.48	1.48

Table 8-24 Case-2 Nrt Production Value (Unit: million M$)

- Market Price -

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
With Project																				
G.P.V.	10.03	22.52	22.75	25,54	25.79	26.02	26.27	26.42	26.52	26.63	26.68	26.75	27.79	26.86	26.90	27.15	27.20	27.27	27.31	27.36
P.C.	6.52	15.27	15.27	16.87	16.87	16.87	16.87	16.87	16.87	16.87	16.87	16.87	16.87	16.87	16.87	16.87	16.87	16.87	16.87	16.87
N.P.V.	3.51	7.25	7.48	8.67	8.92	9,15	9.40	9.55	9.65	9.76	9.81	9.88	9.92	9.99	10.03	10.28	10.33	10.40	10.44	10.49
Without Project																				
G.P.V.	1.72	5.06	5.11	5.17	5.22	5,27	5.33	5.38	5.41	5.45	5.49	5.52	5.52	5.53	5.53	5.53	5.53	5.54	5.54	5.54
P.C.	1.42	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
N.P.V.	0.30	1.06	1.11	1,17	1.22	1.27	1.33	1.38	1.41	1.45	1.49	1.52	1.52	1.53	1.53	1.53	1.53	1.54	1.54	1.54
Incremental N.P.V.	3.21	6.19	6.37	7.50	7.70	7.88	8.07	8.17	8.24	8.31	8.32	8.36	8.40	8.46	8.50	8.75	8.80	8.87	8.91	8.95

Table 8-25 Case-3 Net Production Value (Unit: million M$)
- Market Price -

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
With Project																				
G.P.V.	12.83	26.62	26.89	30.27	30.56	30.85	31.14	49.77	79.47	80.17	98.02	99.24	100.26	101.05	101.25	101.73	101.93	102.23	102.44	102.72
P.C.	8.76	18.03	18.03	20.09	20.09	20.09	20.09	32.80	56.44	56.44	62.96	63.45	63.94	63.94	63.94	63.94	63.94	63.94	63.94	63.94
N.P.V.	4.07	8.59	8.86	10.18	10.47	10.76	11.05	16.97	23.03	23.73	35.06	35.79	36.32	37.11	37.31	37.79	37.99	38.29	38.50	38.78
Without Project																				
G.P.V.	1.90	7.12	7.20	7.23	7.35	7.43	7.51	8.82	12.56	12.64	17.93	17.99	18.05	18.06	18.06	18.07	18.07	18.08	18.08	18.09
P.C.	1.55	6.49	6.49	6.49	6.49	6.49	6.49	7.53	10.85	10.85	14.88	14.88	14.88	14.88	14.88	14.88	14.88	14.88	14.88	14.88
N.P.V.	0.35	0.63	0.71	0.74	0.86	0.94	1.02	1.29	1.71	1.79	3.05	3.11	3.17	3.18	3.18	3.19	3.19	3.20	3.20	3.21
Incremental N.P.V.	3.72	7.96	8.15	9.44	9.61	9.82	10.03	15.68	21.32	21.94	32.01	32.68	33.15	33.93	34.13	34.60	34.80	35.09	35.30	35.57

Table 8-26 Case-4 Net Production Value (Unit: million M$)
- Market Price -

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
With Project																				
G.P.V.	12.83	26.62	26.89	30.27	30.56	30.85	31.14	37.67	47.95	48.30	58.59	59.44	60.13	62.57	62.67	62.99	63.09	63.23	63.33	63.45
P.C.	8.76	18.03	18.03	20.09	20.09	20.09	20.09	24.45	31.00	31.00	37.31	37.66	38.00	38.46	38.36	38.36	38.36	38.36	38.36	38.36
N.P.V.	4.07	8.59	8.86	10.18	10.47	10.76	11.05	13.22	16.95	17.30	21.28	21.78	22.13	24.21	24.31	24.63	24.73	24.87	24.97	25.09
WIthout Project																				
G.P.V.	1.90	7.12	7.20	7.23	7.35	7.43	7.51	8.82	12.56	12.64	17.03	17.09	17.14	17.15	17.15	17.16	17.17	17 17	17.18	17.18
P.C.	1.55	6.49	6.49	6.49	6.49	6.49	6.49	6.49	7.53	10.85	10.85	14.14	14.14	14.14	14.14	14.14	14.14	14.14	14.14	14.14
N.P.V.	0.35	0.63	0.63	0.74	0.86	0.94	1.02	1.29	1.71	1.79	2,89	2.95	3.00	3.01	3.01	3.02	3.03	3.03	3.04	3.04
Incremental N.P.V.	3.72	7.96	8.23	9.44	9.61	9.82	10.03	11.93	15.24	15.51	18.39	18.83	19.13	21.20	21.30	21.61	21.70	21.84	21.93	22.05

Table 8-27 Case-5 Groth Production Value, Production Cost and Net Production Value

-Maket Price- Unit: Million MS

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
With Project																				
G.P.V. :																				
Paddy	5.56	15.72	15.93	19.14	19.38	19.57	19.77	25.46	55.00	55.31	70.23	71.26	72.13	73.09	73.19	73.33	73.43	73.58	73.68	73.80
Upland Crop	29.73	31.86	34.14	35.22	37.01	37.10	37.19	60.55	60.57	60.60	66.18	66.19	66.19	66.19	66.19	66.19	66.19	66.19	66.19	66.19
Total	35.29	47.58	50.07	54.36	56.39	56.67	56.96	86.01	115.17	116.11	136.41	137.45	138.32	139.28	139.38	139.52	139.62	139.77	139.87	139.99
P.C. :																				
Paddy	2.58	10.82	10.82	12.78	12.78	12.78	12.78	16.61	35.68	35.68	44.96	45.45	45.94	46.43	46.43	46.43	46.43	46.43	46.43	46.43
Upland Crop	23.79	23.86	23.93	23.99	24.06	24.13	24.20	36.95	36.97	36.97	40.97	40.97	40.97	40.97	40.97	40.97	40.97	40.97	40.97	40.97
Total	26.37	34.68	34.75	36.77	36.84	36.91	36.98	53.56	72.65	72.65	85.93	86.42	86.91	87.40	87.40	87.40	87.40	87.40	87.40	87.40
N.P.V.	6.92	12.90	15.32	17 59	19.55	19 76	19.98	32.45	42.92	43.46	50.48	51.03	51.41	51.88	51.98	52.12	52.22	52.37	52.47	52.59
Without Project																				
G.P.V. :																				
Paddy	1.90	7.12	7.20	7.25	7.35	7.43	7.51	8.82	12.56	12.64	17.93	17.99	18.05	18.06	18.06	18.07	18.08	18.08	18.08	18.09
Upland Crop	8.59	8.73	8.84	8.97	9.10	9.22	9.36	9.48	9.61	9.73	9.86	9.98	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99
Total	10.49	15.85	16.04	16.02	16.45	16.65	16.87	18.30	22.17	22.37	27.79	27.97	28.04	28.05	28.05	28.06	28.07	28.07	28.07	28.08
P.C. :																				
Paddy	1.55	6.49	6.49	6.49	6.49	6.49	6.49	7.53	10.85	10.85	14.88	14.88	14.88	14 88	14 88	14 88	14 88	14 88	14 88	14 88
Upland Crop	7.98	8.11	8.23	8.36	8.48	8.60	8.73	8.85	8.97	9.10	9.22	9.35	9.35	9.35	9.35	9.35	9.35	9.35	9.35	9.35
Total	9.53	14.60	14.72	14.85	14.97	15.09	15.22	16.38	19.82	19.95	24.10	24.23	24.23	24.23	24.23	24.23	24.23	24.23	24.23	24.23
N.P.V.:	0.96	1.25	1.32	1.35	1.48	1.56	1.65	1.92	2.55	2.42	3.69	3.74	3.81	3.82	3.82	3.83	3.84	3.84	3.84	3.85
Incremental N.P.V.	5.96	11.65	14.00	16.24	18.07	18.20	18.33	30 53	40.57	41.04	46.79	47.29	47.60	48.06	48.16	48.29	48.38	48.53	48.63	48.74

Table 8-28. Case-1 Net Production Value (unit: million M$)
- Economic Price-

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
With Project																				
G.P.V.	2.81	2.83	2.88	2.94	2.99	3.00	3.02	3.03	3.04	3.06	3.07	3.09	3.10	3.12	3.13	3.15	3.16	3.18	3.19	3.19
P.C.	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94
N.P.V.	0.87	0.89	0.94	1.00	1.05	1.06	1.08	1.09	1.10	1.12	1.13	1.15	1.16	1.18	1.19	1.21	1.22	1.24	1.25	1.25
Without Project																				
G.P.V.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P.C.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N.P.V.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Incremental N.P.V.	0.87	0.89	0.94	1.00	1.05	1.06	1.08	1.09	1.10	1.12	1.13	1.15	1.16	1.18	1.19	1.21	1.22	1.24	1.25	1.25

Table 8-29. Case-2 Net Production Value (unit: million M$)
-Economic Price-

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
With Project																				
G.P.V.	7.88	17.70	17.88	20.07	20.27	20.45	20.65	20.77	20.85	20.93	20.97	21.07	21.06	21.11	21.14	21.34	21.38	21.43	21.47	21.50
P.C.	4.91	11.51	11.51	12.78	12.78	12.78	12.78	12.78	12.78	12.78	12.78	12.78	12.78	12.78	12.78	12.78	12.78	12.78	12.78	12.78
N.P.V.	2.97	6.29	6.37	7.29	7.49	7.67	7.87	7.99	8.07	8.15	8.19	8.24	8.28	8.33	8.36	8.56	8.60	8.65	8.69	8.72
Without Project																				
G.P.V.	1.35	3.98	4.02	4.06	4.10	4.10	4.14	4.19	4.23	4.26	4.28	4.31	4.34	4.34	4.35	4.35	4.35	4.35	4.35	4.35
P.C.	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
N.P.V.	0.33	2.96	3.00	3.04	3.08	3.08	3.12	3.17	3.21	3.24	3.26	3.29	3.32	3.32	3.33	3.33	3.33	3.33	3.33	3.33
Incremental N.P.V.	2.64	3.33	3.37	4.25	4.41	4.59	4.75	4.82	4.86	4.91	4.93	4.95	4.96	5.01	5.03	5.23	5.27	5.32	5.36	5.39

Table 8-30. Case-3 Net Production Value (Unit: million M$)
- Economic Price -

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
With Project																				
G.P.V.	10.08	20.93	21.13	23.79	24.02	24.24	24.47	39.12	62.46	63.01	77.04	78.00	78.81	79.42	79.58	79.96	80.12	80.36	80.51	80.73
P.C.	6.60	13.59	13.59	15.14	15.14	15.14	15.14	24.71	39.09	39.09	47.44	47.81	48.18	48.55	48.55	48.55	48.55	48.55	48.55	48.55
N.P.V.	4.48	7.34	7.54	8.65	8.88	9.10	9.33	14.41	23.37	23.92	29.60	30.19	30.63	30.87	31.03	31.41	31.57	31.81	31.96	32.18
Without Project																				
G.P.V.	1.49	5.60	5.66	5.68	5.78	5.84	5.91	6.94	9.87	9.91	14.09	14.14	14.19	14.19	14.20	14.20	14.20	14.21	14.21	14.22
P.C.	1.12	4.67	4.67	4.67	4.67	4.67	4.67	5.42	7.81	7.81	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72
N.P.V.	0.37	0.93	0.99	1.01	1.11	1.17	1.24	1.52	2.06	2.10	3.37	3.42	3.47	3.47	3.48	3.48	3.48	3.49	3.39	3.49
Incremental N.P.V.	4.11	6.41	6.55	7.64	7.77	7.93	8.09	12.89	21.31	21.82	26.23	26.77	27.16	27.40	27.55	27.93	28.09	28.32	28.47	28.69

Table 8-31. Case-4 Net Production Value (Unit: million M$)
- Economic Price -

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
With Project																				
G.P.V.	10.08	20.93	21.13	23.79	24.02	24.24	24.47	29.61	37.69	37.96	46.05	46.72	47.26	49.18	49.26	49.51	49.59	49.70	49.78	49.87
P.C.	6.60	13.59	13.59	15.14	15.14	15.14	15.14	18.43	23.36	23.36	28.12	28.38	28.64	28.90	28.90	28.90	28.90	28.90	28.90	28.90
N.P.V.	3.48	7.34	7.54	8.65	8.88	9.10	9.33	11.18	14.33	14.60	17.93	18.34	18.62	20.28	20.36	20.61	20.69	20.80	20.88	20.88
Without Project																				
G.P.V.	1.49	5.60	5.66	5.68	5.78	5.84	5.91	6.94	9.87	9.93	13.38	13.43	13.47	13.48	13.48	13.49	13.49	13.50	13.50	13.50
P.C.	1.12	4.67	4.67	4.67	4.67	4.67	4.67	5.42	7.81	7.81	10.18	10.18	10.18	10.18	10.18	10.18	10.18	10.18	10.18	10.18
N.P.V.	0.37	0.93	0.99	1.01	1.11	1.17	1.24	1.52	2.06	2.12	3.20	3.25	3.29	3.30	3.30	3.31	3.31	3.32	3.32	3.32
Incremental N.P.V.	3.11	6.41	6.55	7.64	7.77	7.93	8.09	9.66	12.27	12.48	14.73	15.09	15.33	16.98	17.06	17.30	17.38	17.48	17.56	17.56

Table 8-32 Case-5 Groth Production Value,Production Cost and Net Production Value

- Economic Price- Unit:Million MS

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
With Project																				
G.P.V.:																				
Paddy	5.02	13.55	13.51	16.23	16.44	16.60	16.77	21.59	46.64	47.07	59.56	60.42	61.16	61.98	62.06	62.19	62.27	62.39	62.48	62.58
Upland Crop	23.93	25.64	27.49	28.34	29.78	29.85	29.92	48.66	48.68	48.71	53.01	53.01	53 01	53.01	53.01	53.01	53.01	53.01	53.01	53.01
Total	26.95	38.97	41.00	44.57	46.22	46.45	46.69	70.25	95.32	95.78	112.57	113.43	114.17	114.99	115.07	115.20	115.28	115.40	115.49	115.59
P.C. :																				
Paddy	1.94	8.15	8.15	9.63	9.63	9.63	9.63	12.52	26.88	26.88	33.88	34.25	34.62	34.98	34.98	34.98	34.98	34.98	34.98	34.98
Upland Crop	16.33	16.37	16.42	16.46	16.51	16.55	16.60	25.89	25.90	25.91	28.61	28.62	28.62	28.62	28.62	28.62	28.62	28.62	28.62	28.62
Total	18.27	24.52	24.57	26.09	26.14	26.18	26.23	38.41	52.78	52.79	62.49	62.87	63.24	63.60	63.60	63.60	63.60	63.60	63.60	63.60
N.P.V. :	8.68	14.45	16.43	18.48	20.08	20.27	20.46	31.84	42.54	42.99	50.08	50.56	50.93	51.39	51.47	51.60	51.68	51.80	51.89	51.99
Without Project																				
G.P.V.																				
Paddy	1.61	6.04	6.11	6.15	6.24	6.30	6.37	7.48	10.65	10.72	15.21	15.26	15.31	15.31	15.32	15.32	15.33	15.33	15.33	15.34
Upland Crop	6.91	7.01	7.11	7.21	7.32	7.42	7.52	7.62	7.72	7.82	7.93	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03
Total	8.52	13.05	13.22	13.34	13.56	13.72	13.99	15.10	18.37	18.54	23.14	23.29	23.34	23.34	23.35	23.35	23.36	23.36	23.36	23.37
P.C.																				
Paddy	1.12	4.67	4.67	4.67	4.67	4.67	4.67	5.42	7.81	7.81	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72
Upland Crop	5.37	5.46	5.54	5.62	5.70	5.78	5.86	5.94	6.02	6.10	6.19	6.27	6.27	6.27	6.27	6.27	6.27	6.27	6.27	6.27
Total	6.49	10.13	10.21	10.29	10.37	10.45	10.53	11.36	13.83	13.91	16.91	16.99	16.99	16.99	16.99	16.99	16.99	16 99	16 99	16 99
N.P.V.	2.03	2.92	3.01	3.05	3.19	3.27	3.46	3.74	4.54	4.63	6.23	6.30	6.35	6.35	6.36	6.36	6.37	6.37	6.37	6.38
Incremental N.P.V.	6.65	11.53	13.42	15.43	16.89	17.00	17.00	28.10	38.00	38.36	43.85	44.26	44.58	45.04	45.11	45.24	45.31	45.43	45.52	45.61

Table 8-33 Unit Capital Cost of Main Pump Station in 1977 Year's Price

- ENEX, KRBS -

KRBS Project	Peak Water Demand Qp (m^3/s)	Main P.S. Head H (m)	Capital Cost M$1,000	Irrigation Area (ha)	Unit Cost M$/ha	
North Lemal	10.9	7.2	2,836	9,265	306	
Ulu Lemal	4.6	12.0	1,995	7,371	271	Average
Upper Ulu Lemal	0.4	16.0	231	758	305	274
Sg. Bagan	2.5	11.0	994	4,281	232	
Tasek Garu	15.9	14.0	8,044	18,650	431	
Sg. Sat	3.5	16.5	2,087	6,652	314	
Pertok & Putat Ex. (Panyit)	1.1	12.0	477	1,491	320	

Note: 1. Name of KRBS Projects are based on the ENEX Main Report Vol.2: Drainage and Irrigation, Chapter 5. Irrigation Project. Page 23 - 29.

2. Peak water demand and irrigable area are based on Table 5.2, ENEX Main Report Vol.2.

3. Capital cost of main pump station is estimated using the following method. ENEX Main Report Vol.2. Appendix 2. Pumping installation design parameters:- The Capital cost of a pump station was assumed to be directly proportional to the installed power capacity of the plant.

Installed power = Qc x H x g/Ep

Qc: installed pumping capacity (m^3/s), H: pumping head (m)
g : gravitational constant (m/s^2), Ep: pumping efficiency (%)
Unit capital cost = model P.S cost M$/installed power KW
Capital cost equations = unit capital cost x Qc x H x g/Ep
= 2,360 x Qc x H x g/EP = 2,360 x (Qp/0.8) x H x 9.8/0.8
= M$36,138 x Qp x H (QP: peak irrigation demand)

Table 8-34 Reticulation System Unit Costs in 1977 Year's Price
- ENEX, KRBS -

KRBS Project	Unit Costs (M$ per ha Gross Scheme Area)
North Lemal	3,035 x 0.4 (bris soil) + 2,455 x 0.6 = 2,687
Ulu Lemal	2,455
Upper Ulu Lemal	2,455
Sg. Bagan	2,455
Tasek Garu	3,035 x 0.16 (bris soil) + 2,455 x 0.84 = 2,548
Sg. Sat	2,455
Pertok & Putat Ex. (Panyit)	2,455

Note: Basin irrigation reticulation system costs are based on the ENEX Main Report Vol.2: Drainage and Irrigation, Appendix 8.

	Cost ($ per ha Gross Scheme Area)
Electrical and mechanical	90
Civil	
Primary, secondary and tertiary canals (unlined)	469
Primary, secondary and tertiary canals (lined)[1/]	836
Primary, secondary and tertiary drains	44
Canal structure	379
Drain structure	219
Bridges	23
Operation and maintenance facilities	45
Sub-total (unlined canals)	1,269
x 1.58 multiplier[2/]	2,005
Sub-total (lined canals)	1,636
x 1.58 multiplier[2/]	2,585
Land acquisition (4.5% gross scheme area)	450
Total (unlined canals)	2,455
Total (lined canals)	3,035

1/: Based on earth lining

2/: Multiplier covers preliminaries and unscheduled items (20%), contingencies (20%), design and supervision (20%)

Table 8-35 On-Farm System Unit Costs in 1977 Year's Price

- ENEX, KRBS -

KRBS Project	Unit Costs (M$ per ha Irrigation)
North Lemal	833 x 0.4 (bris soil) + 445 x 0.6 = 601
Ulu Lemal	455
Upper Ulu Lemal	455
Sg. Bagan	455
Tasek Garu	833 x 0.16 (bris soil) + 445 x 0.84 = 507
Sg. Sat	455
Pertok & Putat Ex.(Panyit)	455

Note: On-Farm system unit costs are based on the ENEX Main Report Vol.2: Drainage and Irrigation, Appendix 9.

1. Distribution systems are classified by flood, furrow, sprinkler and trickle irrigation type.

2. Costs component consist of unlined or lined canal (class 1, 2 and 3), drains (class 1, 2 and 3), structures (turnouts, flow, water level) and land acquisition.

3. Costs include the preliminaries & unscheduled items of 20%, contingency of 20% and survey, design & supervision of 10%.

4. Distribution system costs are tabulated as follows.

$ per ha irrigated	Unlined Canals	Lined Canals
Flood	445	833
Furrow	1,507	2,863
Sprinkler	2,387	3,448
Trickle	2,869	3,930

Table 8-36 Operation and Maintenance Unit Cost in 1981 Year's Price

- KADA II East Bank Area -

Item	Financial Cost	Conversion Factor	Economic Cost
1. Labour Cost	M$1,000		M$1,000
Canal	703		
Farm Road	442		
On-Farm	804		
Sub-Total	1,949	0.6	1,169
2. Pump (Kemubu, Booster, Salor)	365	0.8	292
Total	2,314		1,461
Irrigable Area	20,092 ha		20,092 ha
O & M Cost/ha	115 M$		73 M$

Note : Depreciation cost of equipment is excluded because of estimation of replacement costs of pump.

Source: Final Report, KADA II Improvement Project, Kelantan, MOA, Malaysia, 1982, Page 4.7.

Table 8-37 Consumer Price Index. Peninsular Malaysia

Basic Year	Year	Price Index	Price Index 1986/1977
1967	1967	100.0	
	1970	101.3	
	1975	144.0	
	1976	147.7	
	1977	154.8	100.0
	1978	162.4	
	1979	168.3	
	1980	179.5	115.95 (179.5/154.8)
1980	1980	100.0	
	1981	109.7	
	1982	116.1	
	1983	120.4	
	1984	125.1	
	1985	125.5	
	1986	126.8	147.0 (115.95x126.8)

Table 8-38 Capital Cost in 1977 Year's Price - Market Price

Irrigation Project Associated with Lebir Dam Project	Irrigable Area (ha)	Main Pump Station Unit Cost (M$/ha)	Main Pump Station Capital Cost (M$1,000)	Reticulation System Unit Cost (M$/ha)	Reticulation System Capital Cost (M$1,000)	On-Farm System Cost Unit Cost (M$/ha)	On-Farm System Cost Capital Cost (M$1,000)	Total Cost (M$1,000)
North Lemal Phase I	3,644	306	1,115	2,687	9,791	601	2,190	13,096
Ulu Lemal	3,806	274	1,043	2,455	9,344	445	1,693	12,080
Sg. Bagan	1,620	232	376	2,455	3,977	445	721	5,074
Tasek Garu	18,650	431	8,038	2,548	47,520	507	9,456	65,014
Sg. Sat	1,822	314	572	2,455	4,473	445	811	5,856
Panyit	1,234	320	395	2,455	3,029	445	549	3,973
Kusial	1,250	320	400	2,455	3,069	445	556	4,025
Total	32,060		11,939		81,203		15,976	109,118

Table 8-39 Operation and Maintenance Cost in 1981 Price - Market Price -

(unit: M$1,000)

Project	Irrigable Area (ha)	Unit Cost (M$/ha)	O & M Cost (M$1,000)
North Lemal Phase I	3,644	115	419
Ulu Lemal	3,806	115	438
Sg. Bagan	1,620	115	186
Tasek Garu	18,650	115	2,145
Sg. Sat	1,822	115	210
Panyit	1,234	115	142
Kusial	1,250	115	144
Total	32,060		3,684

Table 8-40 Capital Cost in 1986 Year's Price

- Market Price -

(unit: M$1,000)

Irrigation Project Associated with Lebir Dam Project	Capital Cost in 1977 Prices	Price Index 1986/1977	Capital Cost in 1986 Prices
North Lemal Phase I	13,096	1.47	19,251
Ulu Lemal	12,080	1.47	17,758
Sg. Bagan	5,074	1.47	7,459
Tasek Garu	65,014	1.47	95,570
Sg. Sat	5,856	1.47	8,608
Panyit	3,973	1.47	5,840
Kusial	4,025	1.47	5,917

Table 8-41 Operation and Maintenance Cost in 1986 Year's Price

- Market Price -

(unit: M$1,000)

Irrigation Project Associated with Lebir Dam Project	O & M Cost in 1981 Price	Price Index 1986/1981	O & M Cost in 1986 Prices
North Lemal Phase I	419	1.16	486
Ulu Lemal	438	1.16	508
Sg. Bagan	186	1.16	216
Tasek Garu	2,145	1.16	2,488
Sg. Sat	210	1.16	244
Panyit	142	1.16	165
Kusial	144	1.16	167

Table 8-42 Economic Capital Cost in 1986 Year's Price

(unit: M$1,000)

Project	Financial Cost			Economic Cost		
	F.C	L.C	Total	F.C	L.C	Total
North Lemal Phase I	7,700	11,551	19,251	7,700	8,894	16,594
Ulu Lemal	7,103	10,655	17,758	7,103	8,204	15,307
Sg. Bagan	2,984	4,475	7,459	2,984	3,446	6,430
Tasek Garu	38,228	57,342	95,570	38,228	44,153	82,381
Sg. Sat	3,443	5,165	8,608	3,443	3,977	7,420
Panyit	2,336	3,504	5,840	2,336	2,698	5,034
Kusial	2,367	3,550	5,917	2,367	2,734	5,101

Note: 1. Ratio between foreign currency and local currency is assumed at 40% and 60% based on KADA II Main Report, Table 4-24, Page 4-123.

2. Conversion factor for construction cost to be used in local currency is 0.77.

3. F.C: Foreign Currency L.C: Local Currency

Table 8-43 Economic O & M Cost

(unit: M$1,000)

Project	Financial Cost	Economic Cost
North Lemal Phase I	486	389
Ulu Lemal	508	406
Sg. Bagan	216	173
Tasek Garu	2,488	1,990
Sg. Sat	244	195
Panyit	165	132
Kusial	167	134

Note: Economic costs are estimated using general conversion factor of 0.8.

Table 8-44 Economic Analysis --- Market Price Base
(Case 5) (unit: M$ million)

Project Year	Project Cost	O & M Cost	Repl. Cost	Total Cost	Incre. NPV	Benefit	Present Worth Value 18%	19%
1. 1994	4.450	-	-	4,450	-	-4.450	-3.771	-3.739
2. 1995	11.115	-	-	11.115	-	-11.115	-7.983	-7.849
3. 1996	11.115	-	-	11.115	-	-11.115	-6.765	-6.596
4. 1997	11.115	-	-	11.115	-	-11.115	-5.733	-5.543
5. 1998	6.673	-	-	6.673	-	6.673	-2.917	-2.797
6. 1999	-	1.342	-	1.342	5.96	4.618	1.711	1.626
7. 2000	9.55	1.342	-	10.892	11.65	0.758	0.238	0.224
8. 2001	9.55	1.342	-	10.892	14.00	3.108	0.827	0.773
9. 2002	19.10	1.342	-	20.442	16.24	-4.202	-0.948	-0.878
10. 2003	19.10	1.342	-	20.442	18.07	-2.372	-0.453	-0.417
11. 2204	25.93	1.342	-	27.272	18.20	-9.072	-1.469	-1.339
12. 2005	18.44	1.342	-	19.782	18.33	-1.452	-0.199	-0.180
13. 2006	4.07	3.830	-	7.900	30.53	22.630	2.632	2.358
14. 2007	6.105	3.830	-	9.935	40.57	30.635	3.021	2.684
15. 2008	4.09	3.830	-	7.920	41.04	33.120	2.766	2.438
16. 2009	-	4.406	-	4.406	46.79	42.384	3.000	2.619
17. 2010	-	4.406	-	4.406	47.29	42.884	2.573	2.230
18. 2011	-	4.406	-	4.406	47.60	43.194	2.194	1.888
19. 2012	-	4.406	-	4.406	48.06	43.654	1.881	1.602
20. 2013	-	4.406	-	4.406	48.16	43.754	1.597	1.348
21. 2014	-	4.406	-	4.406	48.29	43.884	1.356	1.137
22. 2015	-	4.406	-	4.406	48.38	43.974	1.152	0.959
23. 2016	-	4.406	-	4.406	48.53	44.124	0.980	0.807
24. 2017	-	4.406	-	4.406	48.63	44.224	0.831	0.681
25. 2018	-	4.406	2.534	6.940	48.74	41.800	0.669	0.539
26. 2019	-	4.406	-	4.406	48.74	44.334	0.599	0.483
27. 2020	-	4.406	-	4.406	48.74	44.334	0.510	0.403
28. 2021	-	4.406	-	4.406	48.74	44.334	0.430	0.341
29. 2022	-	4.406	-	4.406	48.74	44.334	0.364	0.284
30. 2023	-	4.406	-	4.406	48.74	44.334	0.310	0.239
31. 2024	-	4.406	-	4.406	48.74	44.334	0.262	0.204
32. 2025	-	4.406	8.038	12.444	48.74	36.296	0.181	0.138
33. 2026	-	4.406	-	4.406	48.74	44.334	0.186	0.142
34. 2027	-	4.406	-	4.406	48.74	44.334	0.160	0.120
35. 2028	-	4.406	1.367	5.773	48.74	42.967	0.129	0.099
36. 2029	-	4.406	-	4.406	48.74	44.334	0.115	0.084
37. 2030	-	4.406	-	4.406	48.74	44.334	0.098	0.071
38. 2031	-	4.406	-	4.406	48.74	44.334	0.084	0.058
39. 2032	-	4.406	-	4.406	48.74	44.334	0.071	0.049
40. 2033	-	4.406	-	4.406	48.74	44.334	0.058	0.044
41. 2034	-	4.406	-	4.406	48.74	44.334	0.049	0.035
42. 2035	-	4.406	-	4.406	48.74	44.334	0.044	0.031
43. 2036	-	4.406	-	4.406	48.74	44.334	0.035	0.027
44. 2037	-	4.406	-	4.406	48.74	44.334	0.031	0.022
45. 2038	-	4.406	2.534	6.940	48.74	41.80	0.027	0.018
46. 2039	-	4.406	-	4.406	48.74	44.334	0.022	0.013
47. 2040	-	4.406	-	4.406	48.74	44.334	0.018	0.013
48. 2041	-	4.406	-	4.406	48.74	44.334	0.018	0.009
49. 2042	-	4.406	-	4.406	48.74	44.334	0.013	0.009
50. 2043	-	4.406	-	4.406	48.74	44.334	0.013	0.009
Total							+1.014	-2.480

$$EIRR = 0.18 + 0.01 \times \frac{1.014}{1.014 + 2.480} = 18.29\%$$

Table 8-45 Economic Analysis --- Economic Price Base
(Case 5) (unit: M$ million)

Project Year	Project Cost	O & M Cost	Repl. Cost	Total Cost	Incre. NPV	Benefit	Present Worth Value 18%	19%
1. 1994	3.835	-	-	3.835	-	-3.835	-3.223	-3.196
2. 1995	9.580	-	-	9.580	-	9.580	-6.765	-6.652
3. 1996	9.580	-	-	9.580	-	-9.580	-5.685	-5.544
4. 1997	9.580	-	-	9.580	-	-9.580	-4.778	-4.620
5. 1998	5.756	-	-	5.756	-	5.756	-2.412	-2.313
6. 1999	-	1.074	-	1.074	6.65	5.576	1.963	1.867
7. 2000	8.240	1.074	-	9.314	11.53	2.216	0.656	0.618
8. 2001	8.240	1.074	-	9.314	13.42	4.106	1.021	0.955
9. 2002	16.480	1.074	-	17.554	15.43	-2.124	-0.444	-0.412
10. 2003	16.480	1.074	-	17.554	16.89	-0.664	-0.117	-0.107
11. 2204	22.350	1.074	-	23.424	17.00	-6.424	-0.948	-0.865
12. 2005	15.856	1.074	-	16.93	17.00	-0.007	-0.001	-0.001
13. 2006	3.510	3.064	-	6.574	28.10	21.526	2.243	2.013
14. 2007	5.265	3.064	-	8.329	38.00	29.675	2.600	2.311
15. 2008	3.515	3.064	-	6.579	38.36	31.781	2.339	2.063
16. 2009	-	3.525	-	3.525	43.85	40.325	2.492	2.182
17. 2010	-	3.535	-	3.525	44.26	40.735	2.118	1.837
18. 2011	-	3.535	-	3.525	44.58	41.055	1.794	1.544
19. 2012	-	3.535	-	3.525	44.04	41.515	1.524	1.299
20. 2013	-	3.535	-	3.525	45.11	41.585	1.281	1.085
21. 2014	-	3.535	-	3.525	45.24	41.815	1.080	1.905
22. 2015	-	3.535	-	3.525	45.31	41.785	0.911	0.756
23. 2016	-	3.535	-	3.525	45.43	41.905	0.767	0.633
24. 2017	-	3.535	-	3.525	45.52	41.995	0.647	0.529
25. 2018	-	3.525	2.476	6.001	45.61	39.609	0.511	0.416
26. 2019	-	3.525	-	3.525	45.61	42.085	0.459	0.366
27. 2020	-	3.525	-	3.525	45.61	42.085	0.383	0.307
28. 2021	-	3.525	-	3.525	45.61	42.085	0.324	0.257
29. 2022	-	3.525	-	3.525	45.61	42.085	0.269	0.215
30. 2023	-	3.525	-	3.525	45.61	42.085	0.227	0.177
31. 2024	-	3.525	-	3.525	45.61	42.085	0.194	0.147
32. 2025	-	3.525	7.853	11.378	45.61	34.232	0.130	0.099
33. 2026	-	3.525	-	3.525	45.61	42.085	0.135	0.101
34. 2027	-	3.525	-	3.525	45.61	42.085	0.114	0.084
35. 2028	-	3.525	1.335	4.860	45.61	40.750	0.094	0.069
36. 2029	-	3.525	-	3.525	45.61	42.086	0.080	0.059
37. 2030	-	3.525	-	3.525	45.61	42.085	0.067	0.051
38. 2031	-	3.525	-	3.525	45.61	42.085	0.055	0.042
39. 2032	-	3.525	-	3.525	45.61	42.085	0.046	0.034
40. 2033	-	3.525	-	3.525	45.61	42.085	0.042	0.029
41. 2034	-	3.525	-	3.525	45.61	42.085	0.034	0.025
42. 2035	-	3.525	-	3.525	45.61	42.085	0.029	0.021
43. 2036	-	3.525	-	3.525	45.61	42.085	0.025	0.017
44. 2037	-	3.525	-	3.525	45.61	42.085	0.021	0.013
45. 2038	-	3.525	2.476	6.001	45.61	39.609	0.016	0.019
46. 2039	-	3.525	-	3.525	45.61	42.095	0.013	0.008
47. 2040	-	3.525	-	3.525	45.61	42.095	0.013	0.008
48. 2041	-	3.525	-	3.525	45.61	42.095	0.008	0.004
49. 2042	-	3.525	-	3.525	45.61	42.095	0.008	0.004
50. 2043	-	3.525	-	3.525	45.61	42.095	0.008	0.004
Total							+2.359	-0.239

$$EIRR = 0.19 + 0.01 \times \frac{2.359}{2.359 + 0.239} = 19.91\%$$

Table 11-1 Area of Each Crop in Kesedar Land Scheme

Location	Rubber	Oil Palm	Total
	ha	ha	ha
Palo Ⅰ	97	1,148	1,245
	(8%)	(92%)	
Palo Ⅱ	381	1,059	1,440
	(26%)	(74%)	
Palo Ⅲ	997	1,397	2,394
	(42%)	(58%)	
Lebir Ⅰ	1,105	0	1,105
	(100%)	(0%)	
Chalil Ⅰ	532	1,066	1,598
	(33%)	(67%)	
Total	3,112	4,670	7,782
	(40%)	(60%)	(100%)

Source : Pembangunan Kawasan Kelantan Selatan
(Penekanan Kepada Aktiviti Sosial)
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Table 11-2 Area of Each Crop in Felda Land Scheme

Location	Gross Area	Rubber	Oil Palm	Net Total
	ha	ha	ha	ha
Aring 1	1,958.2	98.3	1,664.1	1,762.4
Aring 2	2,120.8	185.0	1,617.8	1,802.8
Aring 3	—	269.3	1,663.7	1,933.0
Aring 4	2,570	0	2,313	2,313
Aring 5	2,020	0	1,676	1,676
Aring 6	1,550	0	1,039	1,039
Aring Timur 1	—	454	1,059	1,513
Aring Timur 2	1,603	466	1,056	1,522
Aring Timur 3	1,870	442	1,031	1,473
Aring Timur 4	2,100	0	1,890	1,890
Aring Timur 5	2,400	0	2,160	2,160
Aring Timur 6	1,820	0	1,473	1,473
Total		1,914.6 (9.3%)	18,642.6 (90.7%)	20,557.2 (100%)

Source : Haterial Lampiran A Obtained from Felda in March 1987

Table 11-3 Status of Logging in Lebir Forest Area

Hutan Simpan Lebir (Right Bank)

	Logged	Unlogged	Total
	2,460.24 ha	655.02 ha	3,115.26 ha
	761.47	1,522.88	2,284.35
	0	1,623.97	1,623.97
Total	3,221.71	3,801.87	7,023.58
	(45.9%)	(54.1%)	(100%)

Hutan Simpan Relai (Left Bank)

	Logged	Unlogged	Total
	1,377.74 ha	1,248.30 ha	2,626.04 ha
	2,488.80	181.30	2,670.10
Total	3,866.54	1,429.60	5,296.14
	(73.0%)	(27.0%)	(100%)

Source : Forest Department Kota Bharu 1987 March

Table 11-4 Breakdown of Plantation Area to be Compensated for Lebir Dam

unit : Ha

Location	Item	Total	WL 60m	WL 70m	WL 80m	WL 90m
Kesedar	Rubber	11,050	898	1,789	2,566	4,149
	Oil Palm	16,576	1,348	2,683	3,848	6,223
	Total	27,626	2,246	4,472	6,414	10,372
Felda	Rubber	7,190	38	117	303	688
	Oil Palm	16,775	372	1,142	2,953	6,715
	Total	23,965	410	1,259	3,256	7,403
Total	Rubber	18,240	936	1,906	2,869	4,837
	Oil Palm	33,351	1,720	3,825	6,801	12,938
	Total	51,591	2,656	5,731	9,670	17,775

Nota : Proportions of rubber and Oil Palm are assumed at 4 : 6 in Kesedar and 0.093 : 0.907 in Felda

Table 11-5 Breakdown of Forestry Area to be Inundated by Lebir Dam with regard to status of Logging

unit : Ha

Iossification	Location	WL 60m	WL 70m	WL 80m	WL 90m
Total	Right Bank	1,691	3,324	5,776	8,378
	Left Bank	253	497	863	1,252
	Total	1,944	3,821	6,639	9,630
Logged	Right Bank	778	1,529	2,657	3,854
	Left bank	185	363	630	914
	SubTotal	963	1,892	3,287	4,768
Unlogged	Right Bank	913	1,795	3,119	4,524
	Left Bank	68	134	233	338
	Sub Total	981	1,929	3,352	4,862

Note : Proportions of logged and unlogged assumed at 45 : 54 on the Right Bank and 73 : 27 on the Left Bank.

Table. 11-6 Felda Agricultural Development Cost Per Hectare For Rubber Schemes :Collected in March 1987

(unit;M$)

Year	0	1	2	3	4	5	6	7	8	Total
A. LAND CLEARING & PLANTING										
1. Clearing & Arrangement	0	1,121	149	21	77	0	0	0	0	1,368
2. Survey/Premium, Rent/CAC	85	5	11	11	11	10	10	17	16	175
3. Seeding	-	153	57	4	15	0	0	0	0	228
4. Planting	-	541	292	6	22	0	0	0	0	861
5. Interplanting	-	0	168	0	0	0	0	0	0	168
6. Agriculture Roads	-	66	9	1	6	0	203	196	0	481
7. Water Channel	-	39	1	4	0	0	0	0	0	44
8. Fence	-	22	0	0	0	0	0	0	0	22
9. Insurance	-	97	- 0	0	0	0	0	0	0	97
Subtotal	85	2,045	688	46	131	10	213	212	16	3,447
B. MAINTENANCE										
1. Insurance	-	-	13	12	12	11	11	10	10	79
2. Weeding	-	184	443	302	181	117	112	108	104	1,552
3. Manuring	-	372	362	146	140	137	132	127	122	1,539
4. Pest & Diseases	-	14	27	32	30	29	28	27	26	213
5. Memotong Tunas	-	133	151	85	43	11	8	5	0	136
6. Agriculture Roads	-	12	11	11	11	10	6	9	9	80
7. Water Channel	-	0	13	12	12	11	11	10	10	79
8. Fence	-	0	19	18	16	17	16	16	15	118
9. Terracing & Erosion Control	-	0	56	54	51	49	40	38	37	326
10. Membanci Pokok	-	5	5	5	5	4	4	4	4	37
11. Soil & Foliar Analysis	-	0	0	7	7	7	6	6	6	40
12. PHG Building	-	0	0	0	0	0	0	0	55	55
13. Miscellaneous	-	5	10	7	7	7	5	5	5	52
Subtotal	0	726	1,108	691	517	412	381	367	403	4,605
Total	85	2,771	1,797	737	648	422	594	579	419	8,052

Table. 11-7

FELDA Agricultural Development Cost per Acre For Oil Palm Schemes
(From Felling to Break - Even Point)
(Unit : M$) : Collected in March 1987

Year	1 (Oct-Dec)	2	3	4	5	6	7 (Jan-Sept)	Total
A. Land Clearing & Planting								
1. Felling	61.88	42.97	-	2.47	9.88	-	-	123.5
2. Burning	-	7.72	-	0.17	0.69	-	-	8.58
3. Pruning Stacking & Reburning	-	99.45	-	2.21	8.84	-	-	110.5
4. Lining	-	8.89	-	0.20	0.79	-	-	9.88
5. Agricultural Road(1.5 chains/acre)	-	25.16	2.79	-	-	-	-	27.95
6. Establishment of covers	-	65.52	-	1.45	5.82	-	-	72.8
7. Planting Plantforms(9 @ $1.85 each)	-	19.49	-	0.43	1.73	-	-	21.65
8. Maintenance of Pruned Areas (4 rounds @ 4.5/round)	-	21.06	-	0.47	1.87	-	-	23.4
9. Palm Planting(58¢/Palm)(Labour)	-	26.47	14.25	0.91	3.61	-	-	45.24
10. Cover Crops Maintenance(24 rounds)	-	46.80	135.20	83.20	-	-	-	265.2
11. Planting Points Clearing	-	6.67	15.56	0.49	1.98	-	-	24.7
12. Harvesting Paths Clearing	-	6.67	15.56	0.49	1.98	-	-	24.7
13. Terracing-Mechanical(+0.2 chain/acre)	-	1.87	-	0.04	0.17	-	-	2.08
Sub-total:	61.88	385.04	183.36	92.54	37.36	-	-	760.18
B. Planting Materials								
1. Polybagged Palm for planting	-	93.80	50.51	-	-	-	-	144.31
2. Supplying	-	-	10.14	10.14	10.14	-	-	30.42
Sub-total:	-	93.80	60.65	10.14	10.14	-	-	174.73
C. Fertilisers and Pesticides								
1. Manuring of covers	-	16.89	10.87	0.04	0.17	-	-	27.97
2. Manuring of Palms	-	-	46.92	79.18	105.20	120.93	148.67	500.9
3. Pest and Diseases	-	2.18	13.00	13.00	13.00	13.00	13.0	67.18
Sub-total:	-	19.07	70.79	92.22	118.37	133.93	161.67	596.05
D. Lateriting of Roads & Culverts	-	19.07	70.79	83.07	147.68	-	-	230.75
E. Other Expenditures								
1. Drains	-	-	11.87	1.31	-	-	-	13.18
2. Weeding	-	-	-	37.19	69.45	88.69	127.69	323.02
3. Maintenance of Agricultural Roads, Bridges, Drains, Terraces, Platforms & Other erosion control.	-	0.65	6.76	11.21	10.15	10.14	10.14	49.05
4. Castration, Pollination & Frond Pruning	-	-	-	23.09	23.54	-	-	46.63
5. Crop Insurance	-	-	2.6	2.6	2.6	2.6	2.6	13.0
6. Soil & Foliar Analysis	-	-	-	4.55	4.55	4.55	4.55	18.2
7. Assisted Pollination	-	-	-	-	16.90	59.93	61.23	138.06
8. Palm Sanitation	-	-	-	7.8	7.8	7.8	7.8	31.2
9. Harvesting	-	-	-	-	11.70	70.21	95.84	177.75
10. Transportation	-	-	-	-	4.55	32.76	57.33	94.64
11. Miscellaneous	-	18.20	6.31	11.84	13.66	5.49	14.3	69.8
Sub-total:	-	18.85	27.54	99.59	164.9	282.17	381.48	974.53
TOTAL:	61.88	516.76	342.34	377.56	478.45	416.10	543.15	2736.24

Table. 11-8

KESEDAR FARM BUDGET - RUBBER CULTIVATION (PER HECTARE)

(unit ; Malaysian dollar) ; Collected in March 1987

Cost Items \ Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. Land Clearing and Planting	775.00	17.00	17.00	17.00	90.00	90.00	60.00	60.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Land Tax	6.00	6.00	6.00	6.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Planting Material	300.00	30.00	30.00	30.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4. Agricultural Road	52.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Construction of Drains	13.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6. Miscellaneous Construction	-	-	20.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7. Maintenance:																									
(1) Weeding	64.00	192.00	180.00	174.00	90.00	90.00	90.00	60.00	60.00	60.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00
(2) Manuring	-	71.00	85.22	79.90	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00
(3) Pest and Disease Control	-	6.00	10.00	10.50	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
(4) Planting	-	8.00	16.00	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40
(5) Road and Bridges	-	11.50	11.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
(6) Soil and Foliar Analysis	-	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
(7) Maintenance of Drain	-	-	0.85	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
(8) Terracing and Erosion Control	-	5.00	5.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
(9) Miscellaneous	-	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
(0) Contingency 10%	120.00	38.00	37.13	34.90	21.40	18.00	18.00	16.90	16.90	16.90	16.90	16.90	16.90	16.90	16.90	16.90	16.90	16.90	16.90	16.90	16.90	16.90	16.90	16.90	16.90
Total Cost ($)	1,332.00	441.00	405.00	382.00	326.00	326.00	282.60	282.60	186.50	186.50	186.50	186.50	186.50	186.50	186.50	186.50	186.50	186.50	186.50	186.50	186.50	186.50	186.50	186.50	186.50
Yield (kg./ha)																									
a) Latex	-	-	-	-	-	-	616.00	856.00	1,121.00	1,345.00	1,457.00	1,513.00	1,569.00	1,569.00	1,569.00	1,569.00	1,569.00	1,569.00	1,569.00	1,569.00	1,540.00	1,513.00	1,485.00	1,457.00	1,429.00
b) Scrap	-	-	-	-	-	-	109.00	158.00	197.00	237.00	258.00	267.00	267.00	267.00	267.00	267.00	267.00	267.00	267.00	267.00	272.00	269.00	262.00	258.00	252.00
Income ($/ha.)	-	-	-	-	-	-	1,056.00	1,536.00	1,922.00	2,306.00	2,499.00	2,594.00	2,684.00	2,684.00	2,684.00	2,684.00	2,684.00	2,684.00	2,684.00	2,684.00	2,641.00	2,596.00	2,546.00	2,499.00	2,450.00
Net Revenue ($/ha.)	(1,332.00)	(441.00)	(405.00)	(382.00)	(326.00)	(326.00)	793.40	1,273.40	1,735.50	2,119.50	2,312.50	2,407.50	2,497.50	2,497.50	2,497.50	2,497.50	2,497.50	2,497.50	2,497.50	2,497.50	2,454.50	2,409.50	2,359.50	2,312.50	2,263.50

Note.

Price of latex @ $1.60/kg.

Price of scrap @ 65 c/kg.

Table. 11-9

KESEDAR FARM BUDGET - OIL PALM CULTIVATION (PER HECTARE)

(unit ; Malaysian dollar)

; Collected in March 1987

Cost Items \ Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. Land Clearing	791	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Construction & Upgrade Road	59	-	-	-	371	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. Terraces	237	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4. Planting/Rows/Points/ Paths	206	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Drainage	35	30	25	25	25	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6. Lining	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7. Cover Crop & Shade	198	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8. Field Planting & Supplying	430	59	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9. Manuring	-	185	251	296	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373
10. Crop Upkeep	178	297	297	269	208	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148
11. Pest & Disease Control	-	50	50	80	80	85	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59
12. Field Upkeep (Roads, etc).	-	20	15	15	15	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
13. Pollination & Castration	-	-	74	181	181	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
14. Ramps/Collection Centre	-	-	-	300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15. Tools	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16. Tapping/Harvest/ Tranpsort	-	-	-	55	282	351	421	520	555	601	620	627	627	596	596	578	536	524	512	500	462	451	439	428	422
17. Soil & Leaf Analysis	-	-	-	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18. Miscellaneous	-	-	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-Total	2,159	641	740	1,256	1,544	1,086	1,105	1,204	1,239	1,285	1,304	1,311	1,311	1,280	1,280	1,262	1,220	1,208	1,196	1,184	1,146	1,135	1,123	1,112	1,106
Contingencies 10%	216	64	74	126	154	109	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Deveropment Cost	2,375	705	814	1,382	1,686	1,195	1,105	1,204	1,239	1,285	1,304	1,311	1,311	1,280	1,280	1,262	1,220	1,208	1,196	1,184	1,146	1,135	1,123	1,112	1,106
FFB Yield	-	-	-	-	3.57	7.49	13.51	18.07	22.36	24.21	25.00	25.50	25.50	24.72	24.72	23.94	23.16	22.64	22.11	21.59	20.81	20.29	19.77	19.25	18.99
Income ($ per hectare)	-	-	-	-	940	1,970	3,553	4,752	5,880	6,367	6,575	6,706	6,706	6,501	6,501	6,296	6,091	5,954	5,815	5,678	5,473	5,336	5,200	5,063	4,994
Net Revenue ($/ha.)	(2,375)	(705)	(814)	(1,382)	(746)	775	2,448	3,548	4,641	5,082	5,271	5,395	5,395	5,221	5,221	5,034	4,871	4,746	4,619	4,494	4,327	4,201	4,077	3,951	3,888

Note

Price of ffb at $263/tonne

Table.11-10

Felda Farm Budget of a Typical Settler on 10 Acre Rubber Holding

:Collected in March 1987

(unit:M$)

Year	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Total
PRODUCTION																	
Kg Kering per 1 hectare	163	949	1,186	1,424	1,544	1,602	1,652	1,652	1,652	1,652	1,652	1,652	1,652	1,652	1,631	1,203	22,920
Kg Kering per 10 acre	660	3,839	4,800	5,762	6,246	6,483	6,687	6,687	6,687	6,687	6,687	6,687	6,687	6,687	6,600	4,860	92,753
Value @$2.00/kg($1.68net)	1,109	6,449	8,065	9,680	10,494	10,891	11,234	11,234	11,234	11,234	11,234	11,234	11,234	11,234	11,087	8,178	155,825
LESS:FELDA CHARGES																	
Fertilizer @$38.0/month	114	456	456	456	456	456	456	456	456	456	456	456	456	456	456	342	6,840
Collecting Centre of Latex																	
-Building @$5.0/month	15	60	60	60	60	60	60	60	60	60	60	60	60	60	60	45	900
-Maintenance @$0.05/kg	33	192	240	288	312	324	334	334	334	334	334	334	334	334	330	243	4,638
Insurance @$9.88/ha/year	10	40	40	40	40	40	40	40	40	40	40	40	40	40	40	30	601
Development Fund @$0.0063/kg	4	24	30	36	39	41	42	42	42	42	42	42	42	42	42	31	584
Wages @$2.47/ha/month	30	120	120	120	120	120	120	120	120	120	120	120	120	120	120	90	1,799
Subtotal	206	892	946	1,000	1,028	1,041	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,048	781	15,357
Loan Repayment @$350/month	1,050	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	3,150	63,000
Net Income (Annual)	(147)	1,357	2,918	4,479	5,266	5,650	5,982	5,982	5,982	5,982	5,982	5,982	5,982	5,982	5,840	4 243	77,463
Nilai Kini Bersih @4%	(147)	1,305	2,699	3,984	4,505	4,653	4,734	4,558	4,384	4,220	4,061	3,909	3,762	3,622	3,405	2,385	56,040

Table. 11-11

FELDA Farm Budget of a Typical Settler on 10 Acre Oil Palm Holding

(unit : M$)

: Collected in March 1987

Year	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26-30
Production																				
Tons FFB	74.0	74.0	79.0	83.0	86.0	87.0	85.0	83.0	81.0	79.0	77.0	75.0	73.0	72.0	70.0	68.0	67.0	65.0	62.0	62.0
Tons Kernel	2.5	14.1	16.2	17.4	18.1	18.3	17.9	17.4	17.0	16.6	16.2	15.8	15.3	15.1	14.7	14.3	14.1	13.7	13.0	13.0
Tons Oil	0.45	2.7	3.2	3.5	3.6	3.7	3.6	3.5	3.4	3.3	3.2	3.2	3.1	3.0	2.9	2.9	2.8	2.7	2.6	2.6
Ex Mill Value Per Holding																				
Oil	1230	6937	7970	8561	8905	9004	8807	8561	8354	8167	7970	7774	7528	7429	7232	7036	6937	6740	6396	6396
Kernel	135	810	960	1050	1080	1110	1080	1050	1020	990	960	960	930	900	870	870	840	810	780	780
Total:	1365	7747	8930	9611	9985	10114	9887	9611	9384	9157	8930	8734	8458	8329	8102	7906	7777	7550	7176	7176
Less:Felda Charges																				
Processing and transport a/	315	1665	1778	1868	1935	1958	1913	1868	1823	1778	1733	1688	1643	1620	1575	1530	1508	1463	1395	1395
Fertilizer, Pest and Disease Control b/	290	1160	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110
Agriculture Insurance	5	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Foliar Analysis Charge	5	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Contribution to settler development fund	4	22	24	25	26	26	26	25	24	24	23	23	22	22	21	20	20	20	19	19
Replanting Cess	100	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
State Land Premium & Quit Rent	28	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
Loan Repayment	243*	2850	3517	3517	3517	3517	3517	3517	3517	3517	3517	3517	3517	3517	3346	3196	553			
Net Income (Annual)	375*	1500	1951	2541	2847	2983	2771	2541	2360	2178	1997	1846	1616	1510	1500	1500	4056	4407	4102	4102
Net Income (Monthly)	125	125	163	212	237	246	231	212	197	182	166	154	135	126	125	125	338	367	342	342

a / Overhead factory cost M$2.50/ton FFB
Variable production cost M$4.00/ton FFB
Mill Amortization charge M$10.00/ton FFB
Scheme to Mill transport M$6.00/ton FFB
M$22.50/ton FFB

b / For fertiliser $106/acre from 7th-8th year and $101/acre for 9th year and onwards
For Pest Control $10/acre

* Repayment Assessed to allow incomes of M$1500 per year.

Table 11-12-1(1) COEFFICIENT FOR FORMULAS OF HYDRAULIC PARAMETERS OF CROSS SECTION OF KELANTAN RIVER

(HYDRAULIC RADIUS R = C1 + C2·h) (m)

STATION	C1	C2	MODIFIED DEEPEST RIVERBED LEVEL Z(m)	DISTANCE BETWEEN CROSS SECTIONS(m)
1	0.189286	0.405231	-2.933	0
1-05	0.042726	0.517523	-2.667	1480
1-1	-0.103835	0.629814	-2.499	1480
1-15	-0.250396	0.742105	-2.282	1480
2	-0.396956	0.854396	-2.065	1480
2-05	-0.284792	0.812700	-1.530	1190
2-1	-0.172628	0.771004	-0.995	1190
2-15	-0.060464	0.729308	-0.460	1190
3	0.051700	0.687611	0.075	1190
3-05	0.038211	0.713544	0.306	1092
3-1	0.024721	0.739477	0.536	1092
3-15	0.011232	0.765410	0.767	1092
4	-0.002258	0.791342	0.997	1092
4-05	-0.000824	0.818947	1.000	1212
4-1	-0.221391	0.846552	1.004	1212
4-15	-0.330722	0.874156	1.008	1212
5	-0.440524	0.901761	1.011	1212
5-05	-0.437743	0.901760	1.239	1210
5-1	-0.434962	0.901760	1.467	1210
5-15	-0.432181	0.901760	1.696	1210
6	-0.429400	0.901760	1.924	1210
6-05	-0.403863	0.902891	2.179	1140
6-1	-0.378325	0.904022	2.433	1140
6-15	-0.351025	0.905153	2.688	1140
7	-0.323725	0.906284	2.943	1140
7-05	-0.267361	0.852210	3.072	1045
7-1	-0.210997	0.798136	3.201	1045
7-15	-0.154633	0.744061	3.330	1045
8	-0.098269	0.689987	3.458	1045
8-05	-0.153999	0.743755	3.755	1425
8-1	-0.209730	0.797524	4.052	1425
8-15	-0.265460	0.851292	4.348	1425

Table 11-12-1(2) COEFFICIENT FOR FORMULAS OF HYDRAULIC PARAMETERS OF CROSS SECTION OF KELANTAN RIVER

(HYDRAULIC RADIUS R = C1 + C2·h) (m)

STATION	C1	C2	MODIFIED DEEPEST RIVERBED LEVEL Z(m)	DISTANCE BETWEEN CROSS SECTIONS(m)
9	-0.321190	0.905060	4.645	1425
9-05	-0.221498	0.785451	4.206	1130
9-1	-0.121806	0.665841	3.766	1130
9-15	-0.022114	0.538804	3.327	1130
10	0.077578	0.411767	2.888	1130
10-05	0.131306	0.433715	3.718	1218
10-1	0.185034	0.455663	4.186	1218
10-15	0.238764	0.477611	4.834	1218
11	0.292494	0.499558	5.485	1218
11-05	0.106928	0.536293	5.140	1000
11-1	-0.078639	0.573027	4.795	1000
11-15	-0.264206	0.609761	4.449	1000
12	-0.449772	0.646495	4.104	1000
12-05	-0.435349	0.674939	4.789	1345
12-1	-0.420925	0.703384	5.475	1345
12-15	-0.406502	0.731828	6.160	1345
13	-0.392078	0.760273	6.845	1345
13-05	-0.440447	0.760180	6.716	1330
13-1	-0.488816	0.760087	6.587	1330
13-15	-0.536857	0.759994	6.458	1330
14	-0.585554	0.759901	6.329	1330
14-05	-0.611176	0.751788	6.635	903
14-1	-0.636798	0.743675	6.942	903
14-15	-0.662427	0.735562	7.248	903
15	-0.688056	0.727449	7.554	903
15-05	-0.625857	0.7561355	8.110	1075
15-1	-0.563658	0.784822	8.666	1075
15-15	-0.501459	0.813508	9.222	1075
16	-0.439260	0.842195	9.778	1075
16-05	-0.450417	0.858385	10.025	1330
16-1	-0.461574	0.874575	10.273	1330
16-15	-0.472731	0.890765	10.520	1330

Table 11-12-1(3) COEFFICIENT FOR FORMULAS OF HYDRAULIC PARAMETERS OF CROSS SECTION OF KELANTAN RIVER

(HYDRAULIC RADIUS R = C1 + C2·h) (m)

STATION	C1	C2	MODIFIED DEEPEST RIVERBED LEVEL Z(m)	DISTANCE BETWEEN CROSS SECTIONS(m)
17	-0.483887	0.906955	10.767	1330
17-05	-0.520529	0.895066	10.992	1375
17-1	-0.557271	0.883177	11.217	1375
17-15	-0.593963	0.871288	11.441	1375
18	-0.630654	0.859398	11.666	1375
1-05	-0.655572	0.864584	11.902	1480
18-1	-0.680503	0.869769	12.137	1480
18-15	-0.705543	0.874955	12.372	1480
19	-0.730351	0.888014	12.608	1480

Note: Section No.19 is located immediately downstream of the confluence of the Galas river

Table 11-12-1(4) COEFFICIENT FOR FORMULAS OF HYDRAULIC PARAMETERS OF CROSS SECTION OF KELANTAN RIVER

(SECTIONAL AREA $A = K \cdot h^m$) (m^2)

	K	m	MODIFIED DEEPEST RIVERBED LEVEL Z(m)
1	27.84990	2.04614	-3.400
1-05	45.192025	1.88395	-2.950
1-1	62.53415	1.72176	-2.500
1-15	79.876275	1.55956	-2.050
2	97.21840	1.39737	-1.600
2-05	112.67030	1.43905	-1.200
2-1	128.12220	1.48072	-0.800
2-15	143.57410	1.52239	-0.400
3	159.02600	1.56407	0.000
3-05	186.76262	1.495815	0.250
3-1	214.49925	1.42756	0.500
3-15	242.72912	1.35931	0.750
4	270.95900	1.29105	1.000
4-05	253.98775	1.31661	1.125
4-1	237.01650	1.34216	1.250
4-15	220.04525	1.36772	1.375
5	203.07400	1.39327	1.500
5-05	195.38800	1.39896	1.725
5-1	187.72200	1.40465	1.950
5-15	180.46000	1.41035	2.175
6	172.37000	1.41605	2.400
6-05	184.01150	1.401135	2.625
6-1	195.65300	1.38622	2.850
6-15	207.29450	1.37130	3.075
7	218.93600	1.35639	3.300
7-05	193.39450	1.40427	3.375
7-1	167.85300	1.45214	3.450
7-15	142.31150	1.50002	3.525
8	116.77000	1.54789	3.600
8-05	154.67950	1.47345	3.950
8-1	192.58900	1.39900	4.300
8-15	230.49850	1.32455	4.650

Table 11-12-1(5) COEFFICIENT FOR FORMULAS OF HYDRAULIC PARAMETERS OF CROSS SECTION OF KELANTAN RIVER

(SECTIONAL AREA A =K • h^m) (m^2)

STATION	K	m	MODIFIED DEEPEST RIVERBED LEVEL Z(m)
9	268.40800	1.25010	5.000
9-05	202.84558	1.49596	4.425
9-1	137.28316	1.74181	3.850
9-15	71.72074	1.98866	3.275
10	6.15832	2.23551	2.700
10-05	19.73649	2.08146	2.520
10-1	33.31466	1.92741	3.800
10-15	46.89283	1.77336	4.350
11	60.47100	1.61930	4.900
11-05	45.8291	2.21267	4.875
11-1	31.17882	2.80604	4.850
11-15	6.53273	3.39941	4.825
12	1.88663	3.99278	4.800
12-05	22.76615	3.41313	5.450
12-1	43.64567	2.83348	6.100
12-15	64.52519	2.25383	6.750
13	85.40470	1.67418	7.400
13-05	72.60607	1.73618	7.325
13-1	59.80745	1.79817	7.250
13-15	47.00883	1.86017	7.175
14	34.21020	1.92216	7.100
14-05	27.80476	2.16137	7.450
14-1	21.39931	2.40058	7.800
14-15	14.99387	2.63978	8.150
15	8.58842	2.87899	8.500
15-05	29.17682	2.54855	8.950
15-1	49.76521	2.21810	9.400
15-15	70.35351	1.88691	9.850
16	90.94200	1.55572	10.300
16-05	93.93900	1.53348	10.550
16-1	96.93600	1.51124	10.800
16-15	99.93300	1.48899	11.050

Table 11-12-1(6) COEFFICIENT FOR FORMULAS OF HYDRAULIC PARAMETERS OF CROSS SECTION OF KELANTAN RIVER

(SECTIONAL AREA $A = K \cdot h^m$) (m^2)

STATION	K	m	
17	102.93000	1.46675	11.300
17-05	103.14175	1.48168	11.575
17-1	103.35350	1.49661	11.850
17-15	103.56525	1.51154	12.125
18	103.77700	1.52646	12.400
18-05	105.65500	1.51421	12.650
18-1	107.53300	1.50196	12.900
18-15	109.41100	1.48971	13.150
19	111.28900	1.47746	13.400

Table 11-12-1(7) COEFFICIENT FOR FORMULAS OF HYDRAULIC PARAMETERS OF CROSS SECTION OF LEBIR RIVER

(HYDRAULIC RADIUS R = C1 + C2·h) (m)

STATION	C1	C2	MODIFIED DEEPEST RIVERBED LEVEL Z(m)	DISTANCE BETWEEN CROSS SECTIONS(m)
RS-01	-0.396806	0.713618	22.994	370
01-1	-0.139386	0.705653	22.527	370
02	0.118034	0.697688	22.060	400
02-1	-0.069325	0.6659636	20.303	400
03	-0.256684	0.621584	18.545	250
03-1	-0.332983	0.643015	18.545	250
04	-0.409281	0.664447	18.545	300
04-1	-0.312030	0.674816	17.761	300
05	-0.214779	0.685184	16.976	175
05-1	-0.106241	0.57800	17.059	175
06	0.005597	0.470823	17.142	175
06-1	-0.160737	0.509452	17.444	175
07	-0.327070	0.548081	17.745	220
07-1	-0.297940	0.631941	18.803	220
08	-0.268810	0.715800	19.860	330
08-1	-0.247035	0.692183	19.712	330
09	-0.22726	0.668566	19.573	810
09-1	-0.189197	0.617887	17.042	810
10	-0.151134	0.567208	14.511	600
10-05	-0.154756	0.627124	16.358	600
10-1	-0.158377	0.689704	16.638	600
10-15	-0.161998	0.750952	17.701	600
11	-0.165619	0.812200	18.764	640
11-05	-0.124743	0.796896	18.884	640
11-1	-0.083866	0.781592	18.718	640
11-15	-0.040877	0.766288	18.695	640
12	-0.002113	0.750984	18.672	553
12-05	-0.065997	0.765264	18.961	552
12-1	-0.129881	0.779543	18.249	553
12-15	-0.193765	0.793822	18.037	552
13	-0.257649	0.808101	17.826	565
13-1	-0.251881	0.747657	17.079	565

Table 11-12-1(8) COEFFICIENT FOR FORMULAS OF HYDRAULIC PARAMETERS OF CROSS SECTION OF LEBIR RIVER

(HYDRAULIC RADIUS $R = C1 + C2 \cdot h$) (m)

	C1	C2	MODIFIED DEEPEST RIVERBED LEVEL Z(m)	DISTANCE BETWEEN CROSS SECTIONS(m)
14	-0.246113	0.687213	16.333	770
14-1	-0.194383	0.704934	16.683	770
15	-0.142653	0.722654	17.033	500
15-05	-0.139037	0.719859	16.732	500
15-1	-0.135420	0.717064	16.431	500
15-15	-0.131803	0.714270	16.129	500
16	-0.128186	0.711475	15.828	850
16-1	0.238186	0.735588	15.880	850
17	-0.348186	0.759700	15.931	500
17-05	-0.327922	0.778446	15.919	500
17-1	-0.307658	0.797192	15.907	500
17-15	-0.287395	0.815938	15.895	500
18	-0.267131	0.834683	15.883	700
18-05	-0.259734	0.788216	15.579	700
18-1	-0.252336	0.741748	15.276	700
18-15	-0.244939	0.695281	14.973	700
19	-0.237541	0.648813	14.670	525
19-1	-0.270496	0.715076	14.555	525
20	-0.303450	0.781338	14.440	950
20-1	-0.250350	0.725705	14.580	950
21	-0.197250	0.670071	14.720	700
21-1	-0.072852	0.648724	13.567	700
22	0.051546	0.627377	12.414	785
22-1	0.120185	0.728073	13.806	785
23	0.188823	0.828769	15.197	800
23-1	0.057787	0.734813	13.642	800
24	-0.073250	0.640857	12.087	545
24-05	-0.145832	0.682724	12.869	545
24-1	-0.218413	0.724591	13.866	545
24-15	-0.290995	0.766458	13.256	545
25	-0.363576	0.808325	13.645	575
25-1	-0.329723	0.806635	13.662	575

Table 11-12-1(9) COEFFICIENT FOR FORMULAS OF HYDRAULIC PARAMETERS OF CROSS SECTION OF LEBIR RIVER

(HYDRAULIC RADIUS R = C1 + C2·h) (m)

26	-0.295869	0.804945	13.680	0

Note: Section RS-26 is located immediately upstream of the confluence of the Galas river

Table 11-12-1(10) COEFFICIENT FOR FORMULAS OF HYDRAULIC PARAMETERS OF CROSS SECTION OF LEBIR RIVER

(SECTIONAL AREA $A = K \cdot h^m$) (m^2)

STATION	K	m	MODIFIED DEEPEST RIVERBED LEVEL Z(m)
RS-01	6.77678	2.45976	23.550
01-1	17.07549	1.89371	22.720
02	27.37420	1.32766	21.891
02-1	17.26827	1.68288	20.424
03	7.16234	2.03809	18.958
03-1	7.09769	1.99784	19.059
04	7.03304	1.96258	19.161
04-1	9.74452	1.80499	18.225
05	12.45600	1.64741	17.289
05-1	7.69457	1.86922	17.222
06	2.93313	2.09103	17.154
06-1	2.07187	2.56031	17.748
07	1.21060	3.02958	18.342
07-1	13.87165	2.29928	19.253
08	26.53270	1.56898	20.163
08-1	20.57990	1.79934	20.038
09	14.62710	2.02969	19.913
09-1	10.62527	1.99538	17.345
10	6.62344	1.96106	14.777
10-05	14.878655	1.82651	15.825
10-1	23.13387	1.69196	16.873
10-15	31.38909	1.55741	17.921
11	39.64430	1.42286	18.968
11-05	41.35635	1.39819	18.895
11-1	43.06840	1.37353	18.822
11-15	44.78045	1.34886	18.748
12	46.49250	1.32419	18.675
12-05	46.24030	1.34076	18.542
12-1	45.98810	1.35732	18.410
12-15	45.74090	1.37389	18.228
13	45.48370	1.39045	18.145
13-1	30.77555	1.52751	17.418

Table 11-12-1(11) COEFFICIENT FOR FORMULAS OF HYDRAULIC PARAMETERS OF CROSS SECTION OF LEBIR RIVER

(SECTIONAL AREA $A = K \cdot h^m$) (m^2)

STATION	K	m	MODIFIED DEEPEST RIVERBED LEVEL Z(m)
14	16.06740	1.66456	16.691
14-1	25.94190	1.62832	19.960
15	35.81640	1.59208	17.230
15-05	34.27873	1.56943	16.925
15-1	32.74105	1.54678	16.619
15-15	31.20337	1.52413	16.313
16	29.66570	1.50148	16.008
16-1	27.34020	1.61195	16.199
17	25.01470	1.72241	16.389
17-05	27.63613	1.66227	16.343
17-1	30.25755	1.60213	16.296
17-15	32.87898	1.54198	16.250
18	35.50040	1.48184	16.203
18-05	28.99734	1.61616	15.912
18-1	22.49428	1.75048	15.620
18-15	15.99122	1.88479	15.328
19	9.48816	2.01911	15.036
19-1	22.42263	1.75190	14.932
20	35.35710	1.48468	14.828
20-1	28.33045	1.67386	14.921
21	21.30380	1.86303	15.014
21-1	24.59865	1.68394	13.673
22	27.89350	1.50484	12.332
22-1	39.91280	1.43420	13.651
23	51.93210	1.36356	14.969
23-1	33.38280	1.55944	13.586
24	14.83350	1.75532	12.201
24-05	20.48150	1.70061	12.675
24-1	26.12950	1.64590	13.148
24-15	31.77750	1.59119	13.622
25	37.42550	1.53648	14.095
25-1	46.6583	1.49667	14.072

Table 11-12-1(12) COEFFICIENT FOR FORMULAS OF HYDRAULIC PARAMETERS OF CROSS SECTION OF LEBIR RIVER

(SECTIONAL AREA $A = K \cdot h^m$) (m^2)

26	55.89110	1.45685	14.048

Note: section RS-26 is located immediately upstream of the confluence of the Galas river

The distance between RS-26 and No. 19 is 1500m

Table 11-12-3(13) COEFFICIENT FOR FORMULAS OF HYDRAULIC PARAMETERS OF CROSS SECTION OF GALAS RIVER

(SECTIONAL AREA $A = K \cdot h^m$ (m^2)

(HYDRAULIC RADIUS $R = C1 + C2 \cdot h$ (m)

STATION	MODIFIED DEEPEST RIVERBED LEVEL(m)	k	m	C1	C2	DISTANCE BETWEEN CROSS SECTIONS(m)
1	14.35	360.0	1.00	0.040309	0.962407	1000
2	15.30	280.0	1.00	0.050909	0.952236	1000
3	16.20	265.0	1.00	0.053892	0.949593	1000
4	17.10	250.0	1.00	0.056725	0.946764	1000
5	18.00	250.0	1.00	0.056725	0.946764	1000
6	18.90	250.0	1.00	0.056725	0.946764	1000
7	19.80	250.0	1.00	0.056725	0.946764	1000
8	20.70	250.0	1.00	0.056725	0.946764	1000
9	21.60	190.0	1.00	0.073025	0.931021	1000
10	22.50	130.0	1.00	0.102567	0.902028	1000
11	23.40	190.0	1.00	0.073025	0.931021	1000
12	24.30	250.0	1.00	0.056725	0.946764	1000
13	25.2	165.0	1.00	0.083008	0.921293	1000
14	26.10	180.0	1.00	0.076617	0.927443	1000

Table 11-12-2(1) PARAMETERS OF CROSS SECTION

** KELATAN RIVER **

(MODIFIED BED EL.)

A = K · h^m (m^2) R = C1 + C2 · h (m)

SECTION NO.	DISTANCE L(m)	BED EL. (m)	K	m	C1	C2
1	0	-2.933	27.8499	2.046140	0.189286	0.405231
2	1000	-2.786	39.5676	1.936550	0.090259	0.481103
3	1000	-2.640	51.2852	1.826960	-0.008769	0.556976
4	1000	-2.493	63.0029	1.717370	-0.107796	0.632848
5	1000	-2.347	74.7205	1.607780	-0.206823	0.708721
6	1000	-2.200	86.4382	1.498190	-0.305851	0.784593
7	1000	-2.029	98.2568	1.400170	-0.389416	0.851593
8	1000	-1.579	111.2420	1.435190	-0.295160	0.816554
9	1000	-1.130	124.2270	1.470210	-0.200905	0.781515
10	1000	-0.680	137.2110	1.505230	-0.106649	0.746476
11	1000	-0.231	150.1960	1.540260	-0.012394	0.711437
12	1000	0.143	167.2260	1.544070	0.047747	0.695210
13	1000	0.354	192.8520	1.481560	0.035394	0.718958
14	1000	0.565	218.4780	1.419060	0.023041	0.742706
15	1000	0.776	244.1030	1.356550	0.010688	0.766454
16	1000	0.987	269.7290	1.294050	-0.001665	0.790202
17	1000	1.000	257.6280	1.311120	-0.088320	0.813025
18	1000	1.003	243.6260	1.332210	-0.178722	0.835801
19	1000	1.006	229.6230	1.353290	-0.269123	0.858577
20	1000	1.008	215.6200	1.374380	-0.359524	0.881354
21	1000	1.031	202.4140	1.393760	-0.440285	0.901761
22	1000	1.219	196.0700	1.398470	-0.437987	0.901761
23	1000	1.408	189.7270	1.403170	-0.435688	0.901761
24	1000	1.597	183.3830	1.407880	-0.433390	0.901760
25	1000	1.785	177.0390	1.412590	-0.431062	0.901760
26	1000	1.984	175.1230	1.412520	-0.423152	0.902027
27	1000	2.212	185.5520	1.399160	-0.399484	0.903041
28	1000	2.441	195.9820	1.385800	-0.375817	0.904054
29	1000	2.669	206.4110	1.372440	-0.352150	0.905067
30	1000	2.897	216.8400	1.359080	-0.328482	0.906080
31	1000	3.041	199.4070	1.392990	-0.280629	0.864939
32	1000	3.165	174.9660	1.438810	-0.226693	0.813194
33	1000	3.288	150.5240	1.484620	-0.172756	0.761448
34	1000	3.411	126.0820	1.530440	-0.118819	0.709702
35	1000	3.587	133.2370	1.515550	-0.122477	0.713343
36	1000	3.795	159.8400	1.463310	-0.161586	0.751075
37	1000	4.003	186.4440	1.411060	-0.200695	0.788807
38	1000	4.212	213.0470	1.358820	-0.239804	0.826539
39	1000	4.420	239.6500	1.306580	-0.278913	0.864272
40	1000	4.628	266.2530	1.254330	-0.318022	0.902004

Pump Station	Section No.
PASIR MAS.	No.16
LEMAL	No.21
SALOR	No.23
KEMUBU	No.34

Table 11-12-2(2) PARAMETERS OF CROSS SECTION

** KELATAN RIVER **

(MODIFIED BED EL.)

A = K · h^m (m^2) R = C1 + C2 · h (m)

SECTION NO.	DISTANCE L(m)	BED EL. (m)	K	m	C1	C2
41	1000	4.288	215.0880	1.450450	-0.240113	0.804765
42	1000	3.899	157.0680	1.668460	-0.151890	0.695629
43	1000	3.510	99.0482	1.886470	-0.063667	0.586493
44	1000	3.122	41.0284	2.104490	0.024556	0.477358
45	1000	3.101	10.6063	2.185040	0.095179	0.418957
46	1000	3.634	21.7543	2.058560	0.139291	0.436976
47	1000	4.167	32.9022	1.932080	0.183404	0.454996
48	1000	4.700	44.0501	1.805600	0.227516	0.473015
49	1000	5.233	55.1980	1.679120	0.271629	0.491035
50	1000	5.303	52.7525	1.932010	0.194700	0.518917
51	1000	4.958	38.1064	2.525380	0.009134	0.555651
52	1000	4.613	23.4603	3.118750	-0.176433	0.592385
53	1000	4.267	8.8142	3.712120	-0.361999	0.629120
54	1000	4.373	10.0677	3.765660	-0.444121	0.657640
55	1000	4.882	25.5915	3.334690	-0.433397	0.678788
56	1000	5.391	41.1153	2.903730	-0.422673	0.699937
57	1000	5.901	56.6391	2.472760	-0.411949	0.721085
58	1000	6.410	72.1629	2.041790	-0.401225	0.742233
59	1000	6.831	83.9901	1.681030	-0.397424	0.760263
60	1000	6.734	74.3671	1.727640	-0.433789	0.760193
61	1000	6.637	64.7441	1.774260	-0.470154	0.760123
62	1000	6.540	55.1210	1.820870	-0.506519	0.760053
63	1000	6.443	45.4980	1.867480	-0.542884	0.759983
64	1000	6.346	35.8750	1.914100	-0.579249	0.759913
65	1000	6.609	28.3430	2.141230	-0.609023	0.752471
66	1000	6.949	21.2504	2.406140	-0.637401	0.743486
67	1000	7.288	14.1569	2.671040	-0.665779	0.734502
68	1000	7.665	12.7060	2.812830	-0.675616	0.733186
69	1000	8.182	31.8581	2.505090	-0.617757	0.759871
70	1000	8.700	51.0101	2.197350	-0.559897	0.786556
71	1000	9.217	70.1621	1.889610	-0.502033	0.813242
72	1000	9.734	89.3141	1.581880	-0.444178	0.839927
73	1000	9.948	93.0039	1.540420	-0.446936	0.853333
74	1000	10.134	95.2572	1.523690	-0.455324	0.865506
75	1000	10.320	97.5106	1.506970	-0.463713	0.877679
76	1000	10.506	99.7640	1.490250	-0.472101	0.888985
77	1000	10.692	102.0170	1.473520	-0.480490	0.902025
78	1000	10.864	103.0220	1.473210	-0.499765	0.901810
79	1000	11.028	103.1760	1.484070	-0.526449	0.893163
80	1000	11.191	103.3300	1.494920	-0.553134	0.884517

Table 11-12-2(3) PARAMETERS OF CROSS SECTION

** KELATAN RIVER **

(MODIFIED BED EL.)

A = K · h^m (m^2) R = C1 + C2 · h (m)

SECTION NO.	DISTANCE L(m)	BED EL. (m)	K	m	C1	C2
81	1000	11.355	103.4840	1.505780	-0.579819	0.875870
82	1000	11.518	103.6380	1.516640	-0.606504	0.867223
83	1000	11.681	103.8980	1.525670	-0.632254	0.859857
84	1000	11.840	105.1660	1.517400	-0.649095	0.864691
85	1000	11.990	106.4350	1.509120	-0.665935	0.869525
86	1000	12.159	107.7040	1.500840	-0.682776	0.874359
87	1000	12.318	108.9730	1.495700	-0.699617	0.879192
88	1000	12.477	110.2420	1.484290	-0.716457	0.884026
89	1000	12.601	111.8950	1.477590	-0.733050	0.888530

Table 11-12-2(4) PARAMETERS OF CROSS SECTION

** LEBIR RIVER **

(MODIFIED BED ELEVATION)

A = K · h^m (m^2) R = C1 + C2 · h (m)

SECTION NO.	DISTANCE (m)	BED EL. (m)	K	m	C1	C2
1	0	12.601	81.5819	1.47274	-0.598118	0.86273
2	1000	13.267	51.2687	1.46479	-0.463186	0.83693
3	1000	13.668	49.4683	1.48455	-0.319419	0.80630
4	1000	13.466	34.8347	1.56158	-0.330282	0.78912
5	1000	12.752	24.4714	1.66196	-0.197105	0.71230
6	1000	12.223	14.4566	1.73818	-0.061784	0.64908
7	1000	14.167	39.6432	1.49333	0.122011	0.76652
8	1000	14.364	44.7358	1.40585	0.147727	0.06029
9	1000	12.591	29.4246	1.49584	0.060290	0.64020
10	1000	13.896	23.6573	1.73610	-0.108394	0.65482
11	1000	14.646	25.0020	1.76346	-0.225197	0.69935
12	1000	14.499	32.3985	1.56433	-0.281092	0.75791
13	1000	14.571	20.5748	1.79007	-0.265788	0.70561
14	1000	14.908	14.5977	1.91357	-0.243353	0.68532
15	1000	15.342	23.8878	1.72169	-0.253921	0.75171
16	1000	15.775	33.1779	1.52981	-0.264489	0.81809
17	1000	15.901	31.5683	1.57205	-0.297527	0.80656
18	1000	15.925	26.3254	1.69234	-0.338054	0.76907
19	1000	15.886	27.0666	1.62494	-0.251127	0.73842
20	1000	15.858	29.8195	1.50375	-0.128548	0.71176
21	1000	16.461	32.8948	1.54905	-0.135781	0.71734
22	1000	17.010	35.1752	1.59443	-0.146012	0.72150
23	1000	16.556	22.3511	1.64150	-0.213194	0.69849
24	1000	17.007	29.3438	1.54085	-0.251320	0.74177
25	1000	17.972	45.6572	1.37906	-0.213711	0.79828
26	1000	18.354	46.1136	1.34908	-0.098084	0.77244
27	1000	18.678	46.0377	1.33074	-0.012971	0.75505
28	1000	18.714	43.3627	1.36929	-0.076840	0.77896
29	1000	18.750	40.6876	1.40783	-0.140710	0.80287
30	1000	17.683	31.2515	1.55965	-0.161937	0.74993
31	1000	15.911	17.4928	1.78390	-0.155902	0.64785
32	1000	15.167	7.6610	1.96996	-0.161002	0.58036
33	1000	18.292	12.6015	2.01232	-0.207993	0.64291
34	1000	18.830	25.2700	1.61784	-0.264403	0.71079
35	1000	17.507	15.0491	1.63296	-0.224732	0.69082
36	1000	18.103	8.6542	1.92799	-0.123816	0.63951
37	1000	19.538	6.9896	2.22702	-0.319466	0.66282

Table 11-12-3(3) RESULT OF UNSTEADY FLOW ANALYSIS OF PUMPING STATION
LEBIR DAM DISCHARGE PATTERN CASE 1
TIDAL LEVEL AT ESTUARY : =0.WL=0.762m(L.L.W.L)
(Consecutive Periodcal Discharge) (Data on the 6th Day)

P.S.	PASIR MAS. (15.0km)		LEMAL (20.0km)		SALOR (22.0km)		KEMUBU (33.0km)	
(HR)	W.L. (m)	Q (m^3/s)	W.L. (m)	Q (m^3/s)	W.L. (m)	Q (m^3/s)	W.L. (m)	Q (m^3/s)
0	2.365	147.255	2.879	143.876	3.102	142.761	5.160	139.356
1	2.356	146.397	2.873	142.872	3.097	141.781	5.162	140.027
2	2.348	145.375	2.868	142.042	3.092	141.086	5.166	141.142
3	2.340	144.315	2.863	141.470	3.088	140.740	5.172	142.584
4	2.335	143.274	2.859	141.213	3.086	140.780	5.180	144.215
5	2.332	142.181	2.857	141.290	3.085	141.200	5.188	145.897
6	2.335	141.010	2.857	141.672	3.087	141.955	5.196	147.508
7	2.342	140.337	2.859	142.314	3.090	142.967	5.203	148.946
8	2.349	140.685	2.863	143.207	3.095	144.157	5.210	150.135
9	2.353	141.899	2.868	144.335	3.100	145.448	5.215	151.023
10	2.354	143.487	2.874	145.614	3.107	146.757	5.218	151.582
11	2.354	145.063	2.879	146.913	3.113	147.989	5.220	151.799
12	2.354	146.454	2.884	148.109	3.118	149.058	5.221	151.679
13	2.354	147.618	2.889	149.113	3.122	149.900	5.219	151.234
14	2.354	148.549	2.892	149.870	3.126	150.471	5.217	150.485
15	2.355	149.235	2.895	150.352	3.128	150.751	5.213	149.460
16	2.357	149.609	2.897	150.545	3.129	150.732	5.207	148.189
17	2.361	149.495	2.898	150.437	3.129	150.420	5.201	146.715
18	2.368	148.814	2.898	150.014	3.128	149.822	5.193	145.105
19	2.377	148.100	2.897	149.288	3.126	148.955	5.185	143.455
20	2.383	147.866	2.896	148.346	3.123	147.864	5.177	141.900
21	2.384	148.017	2.894	147.294	3.119	146.626	5.170	140.595
22	2.381	148.141	2.890	146.195	3.114	145.322	5.165	139.687
23	2.374	147.950	2.885	145.077	3.109	144.036	5.161	139.282

Table 11-12-2(5) PARAMETERS OF CROSS SECTION

** GALAS RIVER **

(MODIFIED BED EL.)

A = K · h^m (m^2) R = C1 + C2 · h (m)

SECTION NO.	DISTANCE L(m)	BED EL. (m)	K	m	C1	C2
1	0	12.601	360.0000	1.000000	0.006821	0.983643
2	1000	13.300	360.0000	1.000000	0.040309	0.962407
3	1000	14.350	360.0000	1.000000	0.040309	0.962407
4	1000	15.300	280.0000	1.000000	0.008643	0.979000
5	1000	16.200	265.0000	1.000000	0.000925	0.977929
6	1000	17.100	250.0000	1.000000	0.056725	0.946764
7	1000	18.000	250.0000	1.000000	0.056725	0.946764
8	1000	18.900	250.0000	1.000000	0.056725	0.946764
9	1000	19.800	250.0000	1.000000	0.056725	0.946764
10	1000	20.700	250.0000	1.000000	0.056725	0.946764
11	1000	21.600	190.0000	1.000000	0.012679	0.969357
12	1000	22.500	130.0000	1.000000	0.012238	0.962743
13	1000	23.400	190.0000	1.000000	0.012679	0.969357
14	1000	24.300	250.0000	1.000000	0.009607	0.976643
15	1000	25.200	215.0000	1.000000	0.011250	0.972786
16	1000	26.100	180.0000	1.000000	0.013250	0.967643