Table 14(1) PRESENT WATER DEMAND

MOLEK AREA

Unit : m3/sec.

Year / Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1981									
	1	-	-	-	-	-	-	-	-
Jan.	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-
Feb.	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-
Mar.	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-
Apr.	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-
May.	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-
Jun.	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-
	1	0	2.22	1.24	3.46	0.09	0.62	0.71	4.17
Jul.	2	0	1.9	1.08	2.98	0.05	0.34	0.39	3.37
	3	0	2.2	1.32	3.52	0.09	0.64	0.73	4.25
	1	0	2.13	1.45	3.58	0.1	0.73	0.83	4.41
Aug.	2	0	1.72	1.47	3.19	0.1	0.75	0.85	4.04
	3	0	1.31	1.46	2.77	0.11	0.77	0.88	3.65
	1	0	0.96	1.49	2.45	0.12	0.83	0.95	3.40
Sept.	2	0.06	0.56	1.44	2.06	0.14	0.82	0.96	3.02
	3	0.09	0.18	1.15	1.42	0.16	0.81	0.97	2.39
	1	1.38	0	0.64	2.02	0.16	0.69	0.85	2.87
Oct.	2	1.66	0	0.14	1.8	0.06	0.06	0.12	1.92
	3	2.02	0	0	2.02	0.07	0.05	0.12	2.14
	1	1.97	0	0	1.97	0	0	0	1.97
Nov.	2	3.08	0	0	3.08	0.13	0.21	0.34	3.42
	3	2.25	0	0	2.25	0	0	0	2.25
	1	1.09	0	0	1.09	0	0	0	1.09
Dec.	2	0.18	0	0	0.18	0	0	0	0.18
	3	0	0	0	0	0	0	0	0

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(2) PRESENT WATER DEMAND

MOLEK AREA

Unit : m3/sec.

Year / Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1982									
	1	0.08	0	0	0.08	0	0	0	0.08
Jan.	2	2.01	0	0	2.01	0	0	0	2.01
	3	1.1	0	0	1.10	0	0	0	1.10
	1	1.11	0	0	1.11	0	0	0	1.11
Feb.	2	2.05	0	0	2.05	0	0	0	2.05
	3	4.32	0	0	4.32	0.16	0	0.16	4.48
	1	4.32	0	0	4.33	0.16	0	0.16	4.49
Mar.	2	1.86	0	0	1.86	0.03	0	0.03	1.89
	3	2.47	0	0	2.47	0.09	0	0.09	2.59
	1	2.33	0.05	0	2.38	0.07	0	0.07	2.45
Apr.	2	2.31	0.07	0	3.37	0.18	0.07	0.25	3.62
	3	1.21	0.90	0	2.11	0	0	0	2.11
	1	2.25	1.22	0	3.47	0.07	0.05	0.12	3.59
May.	2	0.98	1.13	0	2.10	0	0	0	2.10
	3	1.50	0.96	0	2.46	0.07	0.23	0.30	2.76
	1	1.03	0.97	0	1.99	0.06	0.29	0.35	2.34
Jun.	2	0.57	0.96	0.01	1.54	0.04	0.22	0.26	1.80
	3	0.24	1.24	0.01	1.49	0.09	0.67	0.76	2.25
	1	0	1.28	0.21	1.49	0.09	0.73	0.82	2.31
Jul.	2	0	1.13	0.27	1.40	0.05	0.39	0.44	1.84
	3	0	1.30	0.37	1.66	0.09	0.76	0.85	2.51
	1	0	1.92	0.47	2.39	0.10	0.88	0.98	3.37
Aug.	2	0	1.86	0.55	2.41	0.11	0.92	1.03	3.44
	3	0	1.66	0.64	2.30	0.20	0.95	1.15	3.45
	1	0	0.96	0.56	1.52	0.13	1.06	1.19	2.71
Sept.	2	0	0.78	0.57	1.35	0.15	1.14	1.29	2.64
	3	0	0.81	0.58	1.39	0.17	1.22	1.39	2.78
	1	0.06	0.80	0.56	1.42	0.17	1.13	1.30	2.72
Oct.	2	0.09	0.60	0.40	1.09	0.06	0.11	0.17	1.26
	3	1.35	0.59	0.35	2.29	0.07	0.09	0.16	2.45
	1	1.54	0.41	0.20	2.15	0	0	0	2.15
Nov.	2	2.29	0.64	0.25	3.18	0.14	0.42	0.56	3.74
	3	1.88	0.24	0.08	2.20	0	0	0	2.20
	1	1.87	0.10	0.03	2.00	0	0	0	2.00
Dec.	2	1.20	0	0	1.20	0	0	0	1.20
	3	1.19	0	0	1.19	0	0	0	1.19

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Seasaon Paddy

Table 14(3) PRESENT WATER DEMAND

MOLEK AREA (3,991 ha)

Unit : m3/sec.

Year / Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1983									
	1	1.14	0	0	1.14	0	0	0	1.14
Jan.	2	2.16	0	0	2.16	0	0	0	2.16
	3	0.01	0	0	0.01	0	0	0	0.01
	1	0	0	0	0	0	0	0	0
Feb.	2	1.63	0	0	1.63	0	0	0	1.63
	3	4.79	0	0	4.79	0.17	0	0.17	4.96
	1	4.53	0.04	0	4.57	0.18	0	0.18	4.75
Mar.	2	2.52	0.05	0	2.57	0.04	0	0.04	2.61
	3	2.82	0.80	0	3.62	0.10	0	0.10	3.72
	1	2.18	0.97	0	3.15	0.08	0	0.08	3.23
Apr.	2	2.51	1.42	0	3.93	0.19	0.03	0.22	4.15
	3	0.64	0.30	0	0.94	0	0	0	0.94
	1	1.01	0.78	0.02	1.80	0.08	0.02	0.10	1.90
May	2	0.29	0.47	0.02	0.79	0	0	0	0.79
	3	0.21	1.79	0.34	2.34	0.08	0.07	0.15	2.49
	1	0	2.05	0.44	2.48	0.07	0.08	0.15	2.63
Jun.	2	0	2.25	0.53	2.78	0.05	0.09	0.14	2.92
	3	0	2.10	0.72	2.82	0.10	0.36	0.46	3.28
	1	0	2.13	0.86	2.99	0.09	0.46	0.55	3.54
Jul.	2	0	1.80	0.88	2.69	0.05	0.28	0.33	3.02
	3	0	1.97	1.13	3.10	0.09	0.60	0.69	3.79
	1	0	1.79	1.34	3.13	0.10	0.76	0.86	3.99
Aug.	2	0	1.47	1.48	2.95	0.10	0.79	0.89	3.84
	3	0	1.30	1.31	2.61	0.10	0.82	0.92	3.53
	1	0	1.33	1.39	2.71	0.12	0.91	1.03	3.74
Sept.	2	0	1.28	1.40	2.68	0.14	0.91	1.05	3.73
	3	0	1.02	1.40	2.92	0.16	0.91	1.07	3.49
	1	0	0.57	1.25	1.82	0.16	0.79	0.95	2.77
Oct.	2	0	0.13	0.79	0.92	0.06	0.07	0.13	1.05
	3	0	0	0.68	0.68	0.07	0.06	0.13	0.81
	1	-	-	-	-	-	-	-	-
Nov.	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-
Dec.	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(4) PRESENT WATER DEMAND

LODOYO - TULUNGAGUNG AREA

Unit : m3/sec.

Year / Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1981									
	1	3.69	0	-	3.69	0	0	0	3.69
Jan.	2	0.02	0	-	0.02	0	0	0	0.02
	3	2.68	0	-	2.68	0	0	0	2.68
	1	2.33	0	-	2.33	0	0	0	2.33
Feb.	2	5.84	0	-	5.84	0	0.23	0.23	6.07
	3	5.88	0	-	5.88	0	0.23	0.23	6.11
	1	0	0	-	0	0	0	0	0
Mar.	2	1.79	0.07	-	1.86	0	0	0	1.86
	3	1.71	0.08	-	1.79	0	0	0	1.79
	1	2.41	1.35	-	3.76	0	0	0	3.76
Apr.	2	2.58	1.98	-	4.56	0	0.51	0.51	5.07
	3	1.53	2.5	-	4.02	0	0.55	0.55	4.57
	1	0.49	3.01	-	3.50	0	0.61	0.61	4.11
May	2	0	3.55	-	3.55	0	0.66	0.66	4.21
	3	0	4.1	-	4.10	0	0.75	0.75	4.85
	1	0	4.56	-	4.56	0.01	0.78	0.79	5.35
Jun.	2	0	5.12	-	5.12	0.05	1.06	1.11	6.23
	3	0	4.35	-	4.35	0.08	1.34	1.42	5.77
	1	0	4.34	-	4.34	0.11	1.57	1.68	6.02
Jul.	2	0	4.38	-	4.38	0.15	1.71	1.86	6.24
	3	0	4.37	-	4.37	0.2	1.82	2.02	6.39
	1	0	4.46	-	4.46	0.29	2.23	2.52	6.98
Aug.	2	0	3.86	-	3.86	0.36	2.23	2.59	6.45
	3	0	2.92	-	2.92	0.31	1.61	1.92	4.84
	1	0	2.7	-	2.70	0.6	2.33	2.85	5.55
Sept.	2	2	2.06	-	2.06	0.6	2.39	2.99	5.05
	3	0	1.44	-	1.44	0.67	2.42	3.09	4.53
	1	0.18	0.71	-	0.89	0.51	1.45	1.96	2.85
Oct.	2	0.25	0.26	-	0.51	0.7	1.95	2.65	3.16
	3	4.1	0	-	4.10	0.69	1.68	2.37	6.47
	1	5.72	0	-	5.72	0.65	1.35	2	7.72
Nov.	2	3.33	0	-	3.33	0	0	0	3.33
	3	3.33	0	-	3.33	0	0	0	3.33
	1	11.61	0	-	11.61	0.93	0.69	1.62	13.23
Dec.	2	12.25	0	-	12.25	0.7	0.27	0.97	13.22
	3	13.52	0	-	13.52	0.74	0.15	0.89	14.41

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(5) PRESENT WATER DEMAND

LODOYO - TULUNGAGUNG AREA

Unit : m3/sec.

Year / Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1982									
	1	5.35	0	-	5.35	0	0	0	5.35
Jan.	2	0	0	-	0	0	0	0	0
	3	6.17	0	-	6.17	0	0	0	6.17
	1	5.13	0	-	5.13	0	0	0	5.13
Feb.	2	12.24	0.11	-	12.35	0.95	0.93	1.86	14.21
	3	10.99	0.17	-	11.16	0.95	0.82	1.77	12.93
	1	0	2.02	-	2.02	0	0	0	2.02
Mar.	2	1.92	2.09	-	4.01	0	0	0	4.01
	3	1.53	2.28	-	3.81	0	0	0	3.81
	1	1.73	3.7	-	5.43	0.18	0	1.82	7.25
Apr.	2	0.87	5.87	-	6.74	0.79	0.63	1.42	8.16
	3	0	6.78	-	6.78	0.76	0.72	1.48	8.26
	1	0	5.45	-	5.45	0.68	0.80	1.48	6.93
May	2	0	5.58	-	5.58	0.61	1.09	1.70	7.28
	3	0	5.70	-	5.70	0.54	1.37	1.91	7.61
	1	0	5.67	-	5.67	0.48	1.66	2.14	7.81
Jun.	2	0	5.68	-	5.68	0.47	1.68	2.15	7.83
	3	0	5.61	-	5.61	0.44	1.73	2.17	7.78
	1	0	4.94	-	4.94	0.42	1.71	2.13	7.07
Jul.	2	0	3.99	-	3.99	0.42	1.72	2.14	6.13
	3	0	3.05	-	3.05	0.44	1.73	2.17	5.22
	1	0	2.34	-	2.34	0.53	2.03	2.56	4.90
Aug.	2	0	1.37	-	1.37	0.57	2.29	2.86	4.23
	3	0	0.40	-	0.40	0.46	1.84	2.30	2.70
	1	0	0	-	0	0.74	2.99	3.73	3.73
Sept.	2	0	0	-	0	0.84	3.20	4.04	4.04
	3	0	0	-	0	0.95	3.45	4.40	4.40
	1	0	0	-	0	0.72	2.17	2.89	2.89
Oct.	2	0	0	-	0	0.99	2.99	3.98	3.98
	3	0	0	-	0	0.98	2.62	3.60	3.60
	1	0.16	0	-	0.16	0.92	2.18	3.10	3.26
Nov.	2	0.22	0	-	0.22	0	0	0	0.22
	3	2.81	0	-	0.81	0	0	0	2.81
	1	5.2	0	-	5.20	1.31	1.75	3.06	8.26
Dec.	2	6.3	0	-	6.30	0.99	0.69	1.68	7.98
	3	7.84	0	-	7.84	1.05	0.38	1.43	9.27

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(6) PRESENT WATER DEMAND

LODOYO - TULUNGAGUNG AREA

Unit : m3/sec.

Year / Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1983									
	1	5.83	0	-	5.83	0	0	0	5.83
Jan.	2	2.69	0	-	2.69	0	0	0	2.69
	3	7.67	0	-	7.67	0	0	0	7.67
	1	4.72	0	-	4.72	0	0	0	4.72
Feb.	2	12.26	0	-	12.26	1.35	0.74	2.09	14.35
	3	12.41	0	-	12.41	1.34	0.83	2.17	14.58
	1	0	0	-	0	0	0	0	0
Mar.	2	3.89	0.12	-	4.01	0	0	0	4.01
	3	3,99	2,35	-	8.40	0.25	0	0.25	8.65
	1	6.05	2.35	-	8.40	0.25	0	0.25	8.65
Apr.	2	7.35	3.49	-	10.84	1.12	0.58	1.70	12.54
	3	5.63	4.42	-	10.05	1.08	0.63	1.71	11.76
	1	3.91	5.33	-	9.24	0.97	0.66	1.63	10.87
May	2	2.3	6.31	-	8.61	0.87	0.69	1.56	10.17
	3	0.75	7.18	-	7.93	0.77	0.71	1.48	9.41
	1	0	8.09	-	8.09	0.67	0.71	1.38	9.47
Jun.	2	0	6.79	-	6.79	0.64	0.86	1.50	8.29
	3	0	6.92	-	6.92	0.77	1.01	1.78	8.70
	1	0	6.9	-	6.90	0.57	1.17	1.74	8.64
Jul.	2	0	6.93	-	6.93	0.55	1.29	1.84	8.77
	3	0	6.9	-	6.90	0.55	1.44	1.99	8.89
	1	0	6.93	-	6.93	0.65	1.82	2.47	9.40
Aug.	2	0	5.82	-	5.82	0.69	1.97	2.66	8.48
	3	0	4.23	-	4.23	0.54	1.53	2.07	6.30
	1	0	3.69	-	3.69	0.87	2.39	3.26	6.95
Sept.	2	0	2.58	-	2.58	0.99	2.61	3.60	6.18
	3	0	1.51	-	1.51	1.12	2.82	3.94	5.45
	1	0	0.41	-	0.41	0.85	1.81	2.66	3.07
Oct.	2	0	0	-	0	1.16	2.45	3.61	3.61
	3	0	0	-	0	1.16	2.13	3.29	3.29
	1	-	-	-	-	-	-	-	-
Nov.	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-
Dec.	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(7) PRESENT WATER DEMAND

MRICAN AREA

Unit : m3/sec.

Year / Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1981									
	1	5.15	0	0	5.15	0	0	0	5.15
Jan.	2	0.66	0	0	0.66	0	0	0	0.66
	3	9.21	0	0	9.21	0.04	0	0.04	9.25
	1	12.67	0	0	12.67	0.42	0	0.42	13.09
Feb.	2	9.1	0	0	9.1	0	0	0	9.10
	3	4.18	0	0.06	4.24	0	0	0	4.24
	1	0	0.31	0.08	0.39	0	0	0	0.39
Mar.	2	3.8	0.43	1.05	5.27	0	0	0	5.27
	3	5.66	6.13	1.33	13.12	0.12	0	0.12	13.24
	1	6.42	8.82	2.04	17.28	0.8	0.36	1.16	18.44
Apr.	2	4.14	11.86	1.54	17,54	0.96	0.79	1.75	19.29
	3	0.86	5.54	1.07	7.47	0.24	0	0.24	7.71
	1	0	7.65	1.46	9.11	0.65	1.01	1.66	12.96
May.	2	0	8.88	1.68	10.56	0.78	1.62	2.40	12.96
	3	0	9.14	1.7	10.84	0.69	1.68	2.37	13.21
	1	0	9.04	1.63	10.67	0.6	1.72	2.32	12.99
Jun.	2	0	9.05	1.58	10.63	0.57	1.66	2.23	12.86
	3	0	8.9	1.27	10.26	0.54	1.58	2.12	12.28
	1	0	8.87	0.9	9.72	0.55	1.6	2.15	11.87
Jul.	2	0	7.08	2.46	7.46	0.54	2.47	3.01	10.47
	3	0	4.15	2.22	6.36	0.55	3.49	4.04	10.40
	1	0	1.47	3.14	4.61	0.67	5.22	5.89	10.50
Aug.	2	0	0	4.1	4.1	0.72	5.39	6.11	10.21
	3	0	0	3.02	3.02	0.78	5.53	6.31	9.33
	1	0	0	3.39	3.39	0.99	6.52	7.51	10.90
Sept.	2	0	0	3.52	3.52	1.14	6.13	7.27	10.79
	3	0	0	3.63	3.63	1.29	5.75	7.04	10.67
	1	0	0	3.67	3.67	1.43	5.44	6.87	10.54
Oct.	2	0	0	3.62	3.62	1.53	5.14	6.67	10.29
	3	0.26	0	0.79	1.05	0	0	0	1.05
	1	0.4	0	2.67	3.07	1.58	4.36	5.94	9.01
Nov.	2	6.22	0	1.08	7.29	0.73	0.53	1.26	8.55
	3	6.38	0	0.13	6.51	0	0	0	6.51
	1	10.3	0	0	10.3	0.81	0.3	1.11	11.41
Dec.	2	14.21	0	0	14.21	1.31	0.63	1.94	16.15
	3	17.91	0	0	17.91	1.59	0.44	2.03	19.94

WSP : Wet Season Paddy
DSP : Dry Saeson Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(8) PRESENT WATER DEMAND

MRICAN AREA

Unit : m3/sec.

Year / Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1982									
	1	4.92	0	0	4.92	0	0	0	4.92
Jan.	2	0.63	0	0	0.63	0	0	0	0.63
	3	8.79	0	0	8.79	0.05	0	0.05	8.84
	1	12.09	0	0	12.09	0.55	0	0.55	12.64
Feb.	2	8.69	0	0	8.69	0	0	0	8.69
	3	3.99	0	0	3.99	0	0	0	3.99
	1	0	0.21	0.08	0.29	0	0	0	0.29
Mar.	2	3.62	0.29	0.12	4.03	0	0	0	4.03
	3	5.41	4.23	1.67	11.31	0.16	0	0.11	11.47
	1	6.13	6.27	2.41	14.8	1.05	0.36	1.41	15.21
Apr.	2	3.95	8.21	3.24	15.4	1.25	0.74	1.99	17.39
	3	0.82	7.79	1.52	10.14	0.32	0	0.32	10.46
	1	0	6.87	2.11	8.98	0.85	0.84	1.69	10.67
May	2	0	7.95	2.45	10.4	1.02	1.33	2.35	12.75
	3	0	8.19	2.52	10.71	0.90	1.39	2.29	13.00
	1	0	8.13	2.48	10.6	0.78	1.38	2.16	12.76
Jun.	2	0	8.2	2.45	10.64	0.74	1.38	2.12	12.76
	3	0	8.13	2.43	10.56	0.70	1.38	2.08	12.64
	1	0	8.18	2.02	10.19	0.70	1.45	2.15	12.34
Jul.	2	0	6.9	2.37	9.27	0.69	2.44	3.13	12.40
	3	0	4.82	2.05	6.87	0.7	3.55	4.25	11.12
	1	0	3.09	2.27	5.36	0.84	5.53	6.37	11.73
Aug.	2	0	1	1.67	2.67	0.9	5.73	6.63	9.30
	3	0	0	1.71	1.71	0.96	5.86	6.82	8.53
	1	0	0	1.93	1.93	1.23	6.82	8.05	9.98
Sept.	2	0	0	1.99	1.99	1.41	6.59	8.00	9.99
	3	0	0	2.03	2.03	1.59	6.29	7.88	9.91
	1	0	0	2.03	2.03	1.77	6.06	7.83	9.86
Oct.	2	0	0	1.99	1.99	1.87	5.6	7.47	9.46
	3	0	0	0.42	0.42	0	0	0	0.42
	1	0	0	1.48	1.48	1.96	4.29	6.25	7.73
Nov.	2	0.27	0	0.6	0.87	0.91	0.57	1.48	2.35
	3	0.38	0	0.07	0.45	0	0	0	0.45
	1	5.92	0	0	5.92	0.99	0.48	1.47	7.41
Dec.	2	8.57	0	0	8.57	1.62	1.02	2.64	11.21
	3	11.63	0	0	11.63	1.97	0.70	2.67	14.30

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(9) PRESENT WATER DEMAND

MRICAN AREA

Unit : m^3/sec.

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1983									
	1	5.06	0	0	5.06	0	0	0	5.06
Jan.	2	4.79	0	0	4.79	0	0	0	4.79
	3	11.61	0	0	11.61	0.06	0	0.06	11.67
	1	11.02	0	0	11.02	0.68	0	0.68	11.70
Feb.	2	8.03	0	0	8.03	0	0	0	8.03
	3	3.85	0	0	3.85	0	0	0	3.85
	1	0	0.16	0	0.16	0	0	0	0.16
Mar.	2	4.43	0.23	0.08	4.75	0	0	0	4.75
	3	6.9	3.34	0.11	10.35	0.19	0	0.19	10.54
	1	8.45	4.98	1.82	15.25	1.29	0.11	1.40	16.65
Apr.	2	6.47	6.71	2.51	15.7	1.55	0.47	2.02	17.72
	3	2.48	6.46	2.59	11.52	0.39	0	0.39	11.91
	1	1.08	8.97	2.04	12.09	1.05	0.72	1.77	13.86
May	2	0	11.36	2.37	13.73	1.26	1.22	2.48	16.21
	3	0	9.64	2.45	12.1	1.11	1.28	2.39	14.39
	1	0	9.56	2.45	12.01	0.95	1.27	2.22	14.23
Jun.	2	0	9.66	2.48	12.14	0.88	1.30	2.18	14.32
	3	0	9.64	2.45	12.08	0.82	1.33	2.15	14.28
	1	0	8.94	2.50	11.43	0.80	1.45	2.25	13.68
Jul.	2	0	7.25	2.02	9.27	0.76	2.32	3.08	12.35
	3	0	5.55	2.36	7.92	0.74	3.20	3.94	11.86
	1	0	4.24	2.15	6.39	0.86	4.78	5.64	12.03
Aug.	2	0	2.48	2.28	4.75	0.89	5.19	6.08	10.83
	3	0	0.8	1.68	2.48	0.93	5.66	6.59	9.07
	1	0	0	1.88	1.88	1.17	6.9	8.07	9.95
Sept.	2	0	0	1.95	1.95	1.34	6.59	7.93	9.88
	3	0	0	2.01	2.01	1.52	6.29	7.81	9.82
	1	0	0	2.04	2.04	1.68	5.98	7.66	9.70
Oct.	2	0	0	2.01	2.01	1.78	5.14	6.92	8.93
	3	0	0	0.44	0.44	0	0	0	0.44
	1	-	-	-	-	-	-	-	-
Nov.	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-
Dec.	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-

WSP : Wet Season Paddy
DSP : Dry Season Paddy
USDP : Unlicenced Dry Season Paddy

Table 14(10) PRESENT WATER DEMAND

BESUK AREA

Unit : m^3/sec.

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1982									
Jan.	1	0.51	0	-	0.51	0.07	-	0.07	0.58
	2	0.52	0	-	0.52	0.07	-	0.07	0.59
	3	0.54	0	-	0.54	0.07	-	0.07	0.61
Feb.	1	0.57	0	-	0.57	0.07	-	0.07	0.64
	2	0	0	-	0	0	-	0	0
	3	0	0	-	0	0	-	0	0
Mar.	1	0.29	0	-	0.29	0	-	0	0.29
	2	0	0	-	0	0	-	0	0
	3	0	0.02	-	0.02	0	-	0	0.02
Apr.	1	0.17	0.02	-	0.19	0.03	-	0.03	0.22
	2	0.08	0.37	-	0.45	0.06	-	0.06	0.51
	3	0.051	0.51	-	0.51	0.06	-	0.06	0.57
May	1	0	0.64	-	0.64	0.05	-	0.05	0.69
	2	0	0.76	-	0.76	0.05	-	0.05	0.81
	3	0	0.90	-	0.90	0.04	-	0.04	0.94
Jun.	1	0	0.53	-	0.53	0.01	-	0.01	0.54
	2	0	0.73	-	0.73	0.03	-	0.03	0.76
	3	0	0.75	-	0.75	0.03	-	0.03	0.78
Jul.	1	0	0.80	-	0.80	0.03	-	0.03	0.83
	2	0	0.80	-	0.80	0.03	-	0.03	0.83
	3	0	0.79	-	0.79	0.03	-	0.03	0.82
Aug.	1	0	0.73	-	0.73	0.03	-	0.03	0.76
	2	0	0.56	-	0.56	0.04	-	0.04	0.60
	3	0	0.39	-	0.39	0.03	-	0.03	0.42
Sept.	1	0	0.25	-	0.25	0.05	-	0.05	0.30
	2	0	0.08	-	0.08	0.05	-	0.05	0.13
	3	0	0	-	0	0.06	-	0.06	0.06
Oct.	1	0	0	-	0	0.07	-	0.07	0.07
	2	0	0	-	0	0.07	-	0.07	0.07
	3	0	0	-	0	0.07	-	0.07	0.07
Nov.	1	0	0	-	0	0.07	-	0.07	0.07
	2	0.02	0	-	0.02	0.07	-	0.07	0.09
	3	0.03	0	-	0.03	0.80	-	0	0.38
Dec.	1	0.38	0	-	0.38	0	-	0	0.38
	2	0.33	0	-	0.33	0	-	0	0.33
	3	0.04	0	-	0.44	0	-	0	0.44

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(11) PRESENT WATER DEMAND

TURI - TUNGGORONO

Unit : m^3/sec.

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1982									
	1	12.06	0	0	12.06	1.47	0.13	1.60	13.66
Jan.	2	14.02	0	0	14.02	1.48	0.09	1.57	15.59
	3	11.76	0	0	11.76	1.48	0.06	1.54	13.30
	1	12.4	0	0	12.3	1.55	0.02	1.57	13.97
Feb.	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	1	5.93	0	0	5.93	0.07	0	0.07	6.00
Mar.	2	0	0.09	0.11	0.2	0	0	0	0.20
	3	0	0.11	0.13	0.24	0	0	0	0.24
	1	4.48	1.79	2.13	8.39	0.51	0	0.51	8.90
Apr.	2	4.67	2.64	3.15	10.45	1.31	0.2	1.51	11.96
	3	2.73	3.37	4.02	10.13	1.26	0.35	1.61	11.74
	1	0.81	3.84	4.58	9.22	1.01	0.46	1.47	10.69
May	2	0	4.52	5.39	9.92	0.9	0.43	1.33	11.25
	3	0	3.53	4.21	7.74	0.8	0.46	1.26	9.00
	1	0	2.56	3.06	5.62	0.23	0.07	0.30	5.92
Jun.	2	0	3.59	4.28	7.87	0.63	0.53	1.16	9.03
	3	0	3.64	4.34	7.97	0.59	0.63	1.22	9.19
	1	0	3.88	4.63	8.51	0.61	0.7	1.31	9.82
Jul.	2	0	3.83	4.56	8.39	0.59	0.75	1.34	9.73
	3	0	3.34	3.98	7.32	0.58	0.78	1.36	8.68
	1	0	2.83	3.37	6.2	0.68	0.95	1.63	7.83
Aug.	2	0	1.97	2.35	4.33	0.71	1.36	2.06	6.39
	3	0	1.15	1.38	2.53	0.74	1.90	2.64	5.17
	1	0	0.4	0.47	0.87	0.91	2.66	3.57	4.44
Sept.	2	0	0	0	0	1.04	2.80	3.84	3.84
	3	0	0	0	0	1.18	2.94	4.12	4.12
	1	0	0	0	0	1.13	3.14	4.47	4.47
Oct.	2	0	0	0	0	1.41	2.75	4.16	4.16
	3	0	0	0	0	1.49	2.42	3.91	3.91
	1	0	0	0	0	1.44	1.91	3.35	3.35
Nov.	2	0	0	0	0	1.5	1.35	2.85	2.85
	3	0	0	0	0	1.54	0.79	2.33	2.51
	1	0.24	0	0	0	0.24	0	0	0.24
Dec.	2	3.16	0	0	3.16	0	0	0	3.16
	3	3.66	0	0	3.66	0	0	0	3.66

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(12) PRESENT WATER DEMAND

TURI - TUNGGORONO

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1983									
	1	6.95	0	0	6.95	1.47	0.06	1.53	8.48
Jan.	2	8.54	0	0	8.54	1.48	0.06	1.54	10.08
	3	10.16	0	0	10.16	1.48	0.06	1.54	11.7
	1	11.96	0	0	11.96	1.55	0.06	1.61	13.57
Feb.	2	2.96	0	0	2.96	0	0	0	2.96
	3	0.05	0	0	0.05	0	0	0	0.05
	1	5.65	0	0	5.65	0.07	0	0.07	5.72
Mar.	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	1	7.3	0.09	0.1	7.49	0.51	0	0.51	8.00
Apr.	2	9.03	0.12	0.14	9.29	1.31	0.05	1.36	10.65
	3	7,31	1,84	2,21	11.36	1.26	0.08	1.34	12.7
	1	5.1	2.45	2.94	10.49	1.01	0.12	1.13	11.62
May	2	3.57	3.1	3.72	10.39	0.9	0.25	1.15	11.54
	3	2.09	3.68	4.42	10.19	0.8	0.41	1.21	11.40
	1	0.46	3.45	4.14	8.05	0.23	0.08	0.31	8.36
Jun.	2	0	3.29	3.95	7.24	0.64	0.68	1.32	8.56
	3	0	3.37	4.04	7.41	0.61	0.85	1.46	8.87
	1	0	3.68	4.42	8.1	0.63	1.08	1.71	9.81
Jul.	2	0	3.73	4.48	8.21	0.62	0.97	1.59	9.8
	3	0	3.73	4.48	8.21	0.61	0.86	1.47	9.68
	1	0	4.08	4.9	8.98	0.73	0.88	1.61	10.59
Aug.	2	0	3.56	4.27	7.83	0.78	1.11	1.89	9.72
	3	0	2.72	3.26	5.98	0.83	1.39	2.22	8.2
	1	0	2.03	2.43	4.46	1.01	1.85	2.86	7.32
Sept.	2	0	1.18	1.42	2.6	1.16	2.27	3.43	6.03
	3	0	0.38	0.46	0.84	1.32	2.80	4.12	4.96
	1	0	0	0	0	1.49	3.25	4.74	4.74
Oct.	2	0	0	0	0	1.58	2.96	4.54	4.54
	3	0	0	0	0	1.66	2.71	4.37	4.37
	1	-	-	-	-	-	-	-	-
Nov.	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-
Dec.	2	-		-	-	-	-	-	-
	3	-		-	-	-	-	-	-

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(13) PRESENT WATER DEMAND

JATIMLEREK - BUNDER AREA

Unit : m^3/sec.

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1982									
Jan.	1	1.68	0	0	1.68	0.19	0	0.19	1.87
	2	1.27	0	0	1.27	0.19	0	0.19	1.46
	3	1.31	0	0	1.31	0.19	0	0.19	1.50
Feb.	1	1.39	0	0	1.39	0.20	0	0.20	1.59
	2	0	0	0	0	0	0	0	0
	3	0.01	0	0	0.01	0	0	0	0.01
Mar.	1	0.69	0	0	0.69	0.01	0	0.01	0.70
	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
Apr.	1	0.52	0.03	0	0.55	0.07	0	0.07	0.62
	2	0.46	0.04	0.01	0.5	0.17	0	0.17	0.67
	3	0.15	0.61	0.01	0.77	0.16	0	0.16	0.93
May	1	0	0.81	0.18	0.99	0.13	0	0.13	1.12
	2	0	0.99	0.24	1.23	0.12	0	0.12	1.35
	3	0	1.2	03.	1.5	0.10	0	0.10	1.60
Jun.	1	0	0.62	0.14	0.76	0.03	0	0.03	0.79
	2	0	0.088	0.2	1.08	0.08	0	0.08	1.19
	3	0	0.9	0.21	1.11	0.08	0	0.08	1.19
Jul.	1	0	0.98	0.23	1.21	0.08	0	0.08	1.29
	2	0	0.99	0.23	1.22	0.08	0	0.08	1.30
	3	0	0.98	0.23	1.21	0.07	0	0.07	1.28
Aug.	1	0	1.06	0.25	1.31	0.09	0	0.09	1.40
	2	0	0.89	0.24	1.14	0.09	0	0.09	1.23
	3	0	0.62	0.19	0.82	0.10	0	0.10	0.92
Sept.	1	0	0.39	0.12	0.51	0.12	0.04	0.16	0.67
	2	0	0.13	0.04	0.17	0.13	0.11	0.24	0.41
	3	0	0	0	0	0.15	0.16	0.31	0.31
Oct.	1	0	0	0	0	0.17	0.23	0.40	0.40
	2	0	0	0	0	0.18	0.17	0.35	0.35
	3	0	0	0	0	0.19	0.10	0.29	0.29
Nov.	1	0	0	0	0	0.19	0.03	0.22	0.22
	2	0.40	0	0	0.04	0.19	0.01	0.20	0.24
	3	0.05	0	0	0.05	0.20	0.01	0.21	0.26
Dec.	1	0.7	0	0	0.7	0	0	0	0.70
	2	0.65	0	0	0.65	0	0	0	0.65
	3	0.8	0	0	0.8	0	0	0	0.80

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(14) PRESENT WATER DEMAND

GOTTAN ETC.

Unit : m^3/sec.

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1981									
Jan.	1	1.82	0	0	1.82		0	0	1.82
	2	2.35	0	0	2.35		0	0	2.35
	3	1.68	0	0	1.68		0	0	1.68
Feb.	1	0.02	0	0	0.02		0	0	0.02
	2	3.91	0	0	3.91		0.02	0.02	3.93
	3	4.47	0	0	4.49		0.02	0.02	4.49
Mar.	1	1.29	0	0	1.29		0	0	1.29
	2	0	0	0	0		0	0	0
	3	2.88	0	0	2.88		0	0	2.88
Apr.	1	4.09	0	0.01	4.11		0.01	0.01	4.12
	2	3.13	0	0.02	3.15		0.18	0.18	3.33
	3	2.18	0.06	0.32	2.56		0.35	0.35	2.91
May	1	1.17	0.08	0.42	1.67		0.045	0.45	2.12
	2	0.38	0.1	0.52	1		0.57	0.57	1.57
	3	0	0.07	0.62	0.69		0.68	0.68	1.37
Jun.	1	0	0.07	0.44	0.51		0.76	0.76	1.27
	2	0	0.07	0.45	0.52		0.79	0.79	1.31
	3	0	0.07	0.47	0.53		0.83	0.83	1.36
Jul.	1	0	0.08	0.51	0.58		0.95	0.95	15.3
	2	0	0.08	0.51	0.59		0.96	0.96	1.55
	3	0	0.07	0.49	0.56		0.83	0.38	1.39
Aug.	1	0	0.08	0.55	0.63		1.13	1.13	1.76
	2	0	0.06	0.46	0.53		1.20	1.20	1.73
	3	0	0.04	0.32	0.36		1.28	1.28	1.64
Sept.	1	0	0.01	0.20	0.21		1.49	1.49	1.70
	2	0	0	0.07	0.07		1.50	1.50	1.57
	3	0	0	0	0		15.2	1.52	1.52
Oct.	1	0	0	0	0		1.57	1.57	1.57
	2	0	0	0	0		1.55	1.55	1.55
	3	0	0	0	0		1.55		

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(15) PRESENT WATER DEMAND

GOTTAN ETC.

Unit : m^3/sec.

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1982									
Jan.	1	1.08	0	0	1.08	0	0	0	1.08
	2	1.62	0	0	1.62	0	0	0	1.62
	3	1.17	0	0	1.17	0	0	0	1.17
Feb.	1	1.07	0	0	1.07	0	0	0	1.07
	2	4.23	0	0	4.23	0.49	0	0.49	4.72
	3	3.95	0	0	3.95	0.60	0	0.60	4.55
Mar.	1	1.05	0	0	1.05	0	0	0	1.05
	2	0	0	0	0	0	0	0	0
	3	2.36	0	0	2.36	0.16	0	0.16	2.52
Apr.	1	3.38	0	0.01	3.39	0.63	0	0.63	4.02
	2	2.85	0	0.01	2.86	0.62	0	0.62	3.48
	3	2.3	0.07	0.15	2.52	0.59	0	0.59	3.11
May	1	1.61	0.09	0.20	1.90	0.47	0.30	0.77	2.67
	2	1.12	0.12	0.25	1.49	0.42	0.37	0.79	2.28
	3	0.66	0.08	0.29	1.03	0.38	0.44	0.82	1.85
Jun.	1	0.21	0.08	0.34	0.63	0.33	0.49	0.82	1.45
	2	0	0.08	0.26	0.34	0.31	0.53	0.84	1.18
	3	0	0.08	0.27	0.35	0.30	0.58	0.88	1.23
Jul.	1	0	0.09	0.29	0.39	0.33	0.69	1.02	1.41
	2	0	0.09	0.30	0.39	0.33	0.66	0.99	1.38
	3	0	0.09	0.29	0.37	0.30	0.54	0.84	1.21
Aug.	1	0	0.10	0.33	0.42	0.43	0.70	1.13	1.55
	2	0	0.00	0.28	0.36	0.47	0.77	1.24	1.60
	3	0	0.04	0.22	0.26	0.51	0.84	1.35	1.61
Sept.	1	0	0.02	0.16	0.18	0.64	1	1.64	1.82
	2	0	0	0.09	0.09	0.74	1.03	1.77	1.86
	3	0	0	0.03	0.03	0.83	1.07	1.90	1.93
Oct.	1	0	0	0	0	0.94	1.12	2.06	2.06
	2	0	0	0	0	1.00	1.05	2.05	2.05
	3	0	0	0	0	1.05	0.99	2.04	2.04
Nov.	1	0	0	0	0	1.02	0.85	1.87	1.87
	2	0	0	0	0	1.06	0.69	1.75	1.75
	3	0	0	0	0	0.93	0.41	1.34	1.34
Dec.	1	0.06	0	0	0.06	0.99	0.32	1.31	1.37
	2	0.09	0	0	0.09	0	0	0	0.09
	3	1.22	0	0	1.22	0	0	0	1.22

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(16) PRESENT WATER DEMAND

GOTTAN ETC.

Unit : m^3/sec.

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1983									
Jan.	1	1.16	0	0	1.16	0	0	0	1.16
	2	1.42	0	0	1.42	0	0	0	1.42
	3	1.15	0	0	1.15	0	0	0	1.15
Feb.	1	1.10	0	0	1.10	0	0	0	1.10
	2	3.66	0	0	3.66	0.74	0.01	0.75	4.41
	3	3.28	0	0	3.28	0.91	0.01	0.92	4.20
Mar.	1	0.89	0	0	0.89	0	0	0	0.89
	2	0	0	0	0	0	0	0	0
	3	2.24	0	0	2.24	0.25	0	0.25	2.49
Apr.	1	3.28	0	0	3.28	0.95	0.04	0.99	4.27
	2	2.95	0	0.01	2.96	0.92	0.05	0.97	3.93
	3	2.39	0	0.01	2.40	0.89	0.07	0.96	3.36
May	1	1.77	0	0.17	1.94	0.71	0.07	0.78	2.72
	2	1.24	0	0.23	1.47	0.64	0.26	0.90	2.37
	3	0.72	0	0.29	1.02	0.56	0.45	1.01	2.03
Jun.	1	0.27	0	0.38	0.65	0.48	0.61	1.09	1.74
	2	0	0	0.45	0.45	0.45	0.69	1.14	1.59
	3	0	0	0.37	0.37	0.42	0.78	1.20	1.57
Jul.	1	0	0	0.34	0.34	0.43	0.97	1.40	1.74
	2	0	0	0.35	0.35	0.41	0.92	1.33	1.68
	3	0	0	0.34	0.34	0.35	0.75	1.10	1.44
Aug.	1	0	0	0.40	0.40	0.48	0.96	1.44	1.84
	2	0	0	0.39	0.39	0.50	0.97	1.47	1.86
	3	0	0	0.34	0.34	0.52	0.97	1.49	1.83
Sept.	1	0	0	0.28	0.28	0.64	1.08	1.72	2
	2	0	0	0.19	0.19	0.74	1.01	1.75	1.94
	3	0	0	0.11	0.11	0.83	0.95	1.78	1.89
Oct.	1	0	0	0.04	0.04	0.94	0.90	1.84	1.88
	2	0	0	0	0	1.00	0.89	1.89	1.89
	3	0	0	0	0	1.05	0.87	1.92	1.92
Nov.	1	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-
Dec.	1	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-

WSP : Wet Season Paddy
DSP : Dry Season paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(17) PRESENT WATER DEMAND

JATI - KULON

Unit : m^3/sec.

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1981									
	1	0	0	0	0	0	0	0	0
Jan.	2	0.25	0	0	0.25	0	0	0	0.25
	3	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0
Feb.	2	0.86	0	0	0.86	0	0	0	0.86
	3	0.94	0	0	0.94	0	0	0	0.94
	1	0.25	0	0	0.25	0	0	0	0.25
Mar.	2	0	0	0	0	0	0	0	0
	3	0.33	0.02	0	0.35	0	0	0	0.35
	1	0.33	0.03	0	0.36	0	0	0	0.36
Apr.	2	0.11	0.49	0	0.60	0	0	0	0.60
	3	0	0.67	0.07	0.74	0	0	0	0.74
	1	0	0.80	0.1	0.90	0	0	0	0.90
May	2	0	0.97	0.12	1.09	0	0	0	1.09
	3	0	0.71	0.15	0.86	0	0	0	0.86
	1	0	0.71	0.10	0.81	0	0	0	0.81
Jun.	2	0	0.73	0.11	0.84	0	0	0	0.84
	3	0	0.74	0.11	0.85	0	0	0	0.85
	1	0	0.80	0.12	0.92	0	0	0	0.92
Jul.	2	0	0.79	0.12	0.91	0	0	0	0.91
	3	0	0.74	0.12	0.86	0	0	0	0.86
Aug.	1	0	0.72	0.13	0.85	0	0	0	0.85
	2	0	0.50	0.11	0.61	0.01	0	0.01	0.62
	3	0	0.29	0.08	0.37	0.01	0	0.01	0.38
	1	0	0.10	0.05	0.15	0.01	0.01	0.02	0.17
Sept.	2	0	0	0.02	0.02	0.01	0.01	0.02	0.04
	3	0	0	0	0	0.01	0.01	0.02	0.02
	1	0	0	0	0	0.01	0.01	0.02	0.02
Oct.	2	0	0	0	0	0.01	0.03	0.04	0.04
	3	0.02	0	0	0.02	0.01	0.05	0.01	0.08
	1	0.03	0	0	0.03	0.01	0.07	0.08	0.11
Nov.	2	0.46	0	0	0.46	0.01	0.05	0.06	0.52
	3	0.62	0	0	0.62	0.01	0.02	0.03	0.65
	1	0.80	0	0	0.80	0.01	0.00	0.01	0.81
Dec.	2	0.35	0	0	0.35	0	0.00	0.00	0.35
	3	0.64	0	0	0.64	0	000	0.00	0.64

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(18) PRESENT WATER DEMAND

JATI - KULON

Unit : m^3/sec.

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1982									
	1	0.01	0	0	0.01	0	0	0	0.1
Jan	2	0.27	0	0	0.27	0	0	0	0.27
	3	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0
Feb.	2	0.85	0	0	0.85	0.01	0	0.01	0.86
	3	0.92	0	0	0.92	0.01	0	0.01	0.93
	1	0.21	0	0	0.21	0	0	0	0.21
Mar.	2	0	0	0	0	0	0	0	0
	3	0.27	0	0	0.27	0	0	0	0.27
Apr.	1	0.26	0	0	0.26	0.01	0	0.01	0.27
	2	0.09	0.02	0	0.11	0.01	0	0.01	0.12
	3	0	0.03	0.01	0.04	0.01	0	0.01	0.05
	1	0	0.42	0.10	0.52	0.01	0	0.01	0.53
May	2	0	0.57	0.13	0.70	0.01	0	0.01	0.71
	3	0	0.70	0.16	0.86	0.01	0	0.01	0.87
	1	0	0.83	0.10	0.93	0.01	0	0.01	0.94
Jun.	2	0	0.60	0.11	0.71	0.01	0	0.01	0.72
	3	0	0.61	0.11	0.72	0.01	0	0.01	0.73
	1	0	0.67	0.12	0.79	0.01	0	0.01	0.80
Jul.	2	0	0.69	0.12	0.81	0.01	0	0.01	0.82
	3	0	0.67	0.12	0.79	0.01	0	0.01	0.80
	1	0	0.78	0.14	0.92	0.02	0	0.02	0.94
Aug.	2	0	0.77	0.13	0.90	0.03	0	0.03	0.93
	3	0	0.75	0.13	0.88	0.03	0	0.03	0.91
	1	0	0.67	0.11	0.78	0.04	0.00	0.04	0.82
Sept.	2	0	0.47	0.06	0.53	0.05	0.00	0.05	0.58
	3	0	0.27	0.02	0.29	0.06	0.01	0.07	0.36
	1	0	0.09	0	0.09	0.06	0.01	0.07	0.16
Oct.	2	0	0	0	0	0.07	0.00	0.07	0.07
	3	0	0	0	0	0.07	0.01	0.08	0.08
	1	0	0	0	0	0.07	0.01	0.08	0.08
Nov.	2	0.02	0	0	0.02	0.07	0.01	0.08	0.10
	3	0.03	0	0	0.03	0.06	0.01	0.07	0.10
	1	0.48	0	0	0.48	0.07	0.01	0.08	0.56
Dec.	2	0.40	0	0	0.40	0	0	0	0.40
	3	0.54	0	0	0.54	0	0	0	0.54

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(19) PRESENT WATER DEMAND

JATI - KULON

Unit : m3/sec.

Year / Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1983									
	1	0.37	0	0	0.37	0	-	0	0.37
Jan.	2	0.19	0	0	0.19	0	-	0	0.19
	3	0	0	0	0	0	-	0	0
	1	0	0	0	0	0	-	0	0
Feb.	2	0.72	0	0	0.72	0.05	-	0.05	0.77
	3	0.80	0	0	0.80	0.06	-	0.06	0.86
	1	0.23	0	0	0.23	0	-	0	0.23
Mar.	2	0	0	0	0	0	-	0	0
	3	0.41	0	0	0.41	0.02	-	0.02	0.43
	1	0.48	0	0	0.48	0.06	-	0.06	0.54
Apr.	2	0.28	0.02	0.01	0.31	0.06	-	0.06	0.37
	3	0.09	0.02	0.02	0.13	0.06	-	0.06	0.19
	1	0	0.36	0.29	0.65	0.05	-	0.05	0.70
May	2	0	0.48	0.38	0.86	0.04	-	0.04	0.90
	3	0	0.60	0.48	1.08	0.04	-	0.04	1.12
	1	0	0.39	0.31	0.70	0.03	-	0.03	0.73
Jun.	2	0	0.39	0.32	0.71	0.03	-	0.03	0.74
	3	0	0.41	0.33	0.74	0.03	-	0.03	0.77
	1	0	0.45	0.36	0.81	0.03	-	0.03	0.84
Jul.	2	0	0.46	0.36	0.82	0.03	-	0.03	0.85
	3	0	0.44	0.35	0.79	0.02	-	0.02	0.81
	1	0	0.51	0.41	0.92	0.03	-	0.03	0.95
Aug.	2	0	0.50	0.40	0.90	0.04	-	0.04	0.94
	3	0	0.48	0.38	0.86	0.03	-	0.03	0.89
	1	0	0.41	0.33	0.74	0.04	-	0.04	0.78
Sep.t	2	0	0.24	0.19	0.43	0.05	-	0.05	0.48
	3	0	0.08	0.06	0.14	0.06	-	0.06	0.20
	1	0	0	0	0	0.06	-	0.06	0.06
Oct.	2	0	0	0	0	0.07	-	0.07	0.07
	3	0	0	0	0	0.07	-	0.07	0.07
	1	-	-	-	-	-	-	-	-
Nov.	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-
Dec.	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-

WSP : Wet Season Paddy
DSP : Dry Season paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(20) PRESENT WATER DEMAND

WONOKROMO AREA

Unit : m^3/sec.

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1982									
Jan.	1	1.00	0	0	1.00	-	0	0	1.00
	2	1.37	0	0	1.37	-	0	0	1.37
	3	2.63	0	0	2.63	-	0	0	2.63
Feb.	1	0.92	0	0	0.92	-	0	0	0.92
	2	0.03	0	0	0.03	-	0	0	0.03
	3	2.71	0	0	2.71	-	0	0	2.71
Mar.	1	1.68	0	0	1.68	-	0	0	1.68
	2	1.34	0	0	1.34	-	0	0	1.34
	3	3.06	0	0	3.06	-	0	0	3.06
Apr.	1	3.28	0.01	0	3.29	-	0	0	3.29
	2	1.86	0.02	0	1.88	-	0	0	1.88
	3	1.86	0.26	0	2.12	-	0	0	2.12
May	1	1.85	0.37	0	2.21	-	0	0	2.21
	2	0.93	0.38	0	1.31	-	0	0	1.31
	3	0.98	0.55	0	1.53	-	0	0	1.53
Jun.	1	0.57	0.64	0	1.21	-	0.02	0.02	1.23
	2	0.18	0.74	0	0.93	-	0.04	0.04	0.97
	3	0	0.84	0.04	0.88	-	0.05	0.05	0.93
Jul.	1	0	0.94	0.05	0.99	-	0.06	0.06	1.05
	2	0	1.03	0.78	1.81	-	0.10	0.10	1.91
	3	0	1.12	1.02	2.14	-	0.11	0.11	2.25
Aug.	1	0	1	1.3	2.31	-	0.14	0.14	2.45
	2	0	1	1.54	1.54	-	0.14	0.14	2.68
	3	0	0.95	1.8	2.75	-	0.14	0.14	2.89
Sept.	1	0	0.96	1.53	2.49	-	0.16	0.16	2.65
	2	0	0.85	1.58	2.43	-	0.13	0.13	2.56
	3	0	0.73	1.63	2.36	-	0.11	0.11	2.47
Oct.	1	0	0.68	1.85	2.53	-	0.08	0.08	2.61
	2	0	0.55	1.87	2.41	-	0.07	0.07	2.48
	3	0	0.19	0.94	1.14	-	0	0	1.14
Nov.	1	0	0.26	1.61	1.86	-	0.04	0.04	1.90
	2	0	0.1	0.97	1.07	-	0	0	1.07
	3	0	0.05	1.09	1.14	-	0	0	1.14
Dec.	1	0	0	0.48	0.48	-	0	0	0.48
	2	0	0	0	0	-	0	0	0
	3	0	0	0.08	0.08	-	0	0	0.08

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(21) PRESENT WATER DEMAND

WONOKROMO AREA

Unit : $m^3/sec.$

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1983									
Jan.	1	1	0	0	1	-	0	0	1.00
	2	1.13	0	0	1.13	-	0	0	1.13
	3	1.93	0	0	1.93	-	0	0	1.93
Feb.	1	1	0	0	1	-	0	0	1.00
	2	0.95	0	0	0.95	-	0	0	0.95
	3	3.07	0	0	3.07	-	0	0	3.07
Mar.	1	1.42	0	0	1.42	-	0	0	1.42
	2	1.18	0	0	1.18	-	0	0	1.18
	3	2.96	0	0	2.96	-	0	0	2.96
Apr.	1	3.57	0	0	3.57	-	0	0	3.57
	2	2.18	0	0	2.18	-	0	0	2.18
	3	2.25	0.02	0	2.27	-	0	0	2.27
May	1	2.32	0.03	0	2.35	-	0	0	2.35
	2	1.26	0.47	0	1.73	-	0	0	1.73
	3	1.43	0.65	0	2.08	-	0	0	2.08
Jun.	1	0.98	0.81	0	1.79	-	0	0	1.79
	2	0.57	0.98	0	1.55	-	0	0	1.55
	3	0.19	1.15	0.01	1.34	-	0	0	1.34
Jul.	1	0	1.31	0.01	1.31	-	0.01	0.01	1.32
	2	0	1.49	0.11	1.6	-	0.07	0.07	1.67
	3	0	1.66	0.14	1.81	-	0.14	0.14	1.95
Aug.	1	0	1.9	0.19	2.08	-	0.23	0.23	2.31
	2	0	2.06	0.22	2.28	-	0.23	0.23	2.51
	3	0	2.23	0.26	2.49	-	0.23	0.23	2.72
Sept.	1	0	2.17	0.33	2.5	-	0.27	0.27	2.77
	2	0	2.07	0.37	2.44	-	0.22	0.22	2.66
	3	0	1.89	0.32	2.21	-	0.18	0.18	2.39
Oct.	1	0	1.88	0.36	2.24	-	0.15	0.15	2.39
	2	0	1.66	0.36	2.03	-	0.11	0.11	2.14
	3	0	0.71	0.18	0.89	-	0	0	0.80
Nov.	1	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-
Dec.	1	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(22) PRESENT WATER DEMAND

PORONG

Unit : m^3/sec.

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1981									
Jan.	1	4.36	0	0	4.36	0	0	0	4.36
	2	5.97	0	0	5.97	0	0	0	5.97
	3	0.04	0	0	0.04	0	0	0	0.04
Feb.	1	0	0	0	0	0	0	0	0
	2	10.38	0	0	10.38	0.19	0	0.19	10.57
	3	11.77	0	0	11.77	0.23	0.19	0.42	12.19
Mar.	1	2.87	0	0	2.87	0	0	0	2.87
	2	0	0	0	0	0	0	0	0
	3	5.56	0	0	5.56	0.08	0.69	0.77	6.33
Apr.	1	6.93	0.14	0.06	7.13	0.25	1.57	1.82	8.95
	2	4.82	0.20	0.08	5.10	0.24	0.15	0.39	5.49
	3	2.81	3.02	1.27	7.10	0.23	0.79	1.02	8.12
May	1	0.88	3.99	1.67	6.54	0.20	1.86	2.06	8.60
	2	0	4.99	2.04	7.02	0.18	0.25	0.43	7.45
	3	0	5.88	2.45	8.33	0.16	1.81	1.97	10.30
Jun.	1	0	6.85	1.72	8.56	0.18	1.76	1.94	10.50
	2	0	5.20	1.78	6.97	0.25	1.73	1.98	8.95
	3	0	5.35	1.84	7.19	0.33	1.72	2.05	9.24
Jul.	1	0	5.41	1.84	7.25	0.40	1.65	2.05	9.30
	2	0	5.49	1.84	7.33	0.50	1.65	2.15	9.48
	3	0	5.21	1.73	6.94	0.52	1.65	2.17	9.11
Aug.	1	0	5.59	1.59	7.18	0.80	1.75	2.55	9.73
	2	0	4.86	1.47	63.4	0.96	2.08	3.04	9.38
	3	0	3.71	1.15	4.86	1.13	2.40	3.53	8.39
Sept.	1	0	2.89	0.92	3.81	1.53	3.17	4.70	8.51
	2	0	1.68	0.83	2.51	1.76	3.46	5.22	7.73
	3	0	0.54	0.98	1.52	1.99	3.72	5.71	7.23
Oct.	1	0	0	0.87	0.87	2.52	4.51	7.03	7.90
	2	0	0	0.90	0.90	2.67	4.07	6.74	7.64
	3	0.18	0	0.92	1.10	2.81	0	2.81	3.91
Nov.	1	0.27	0	0.93	1.19	2.94	2.26	5.20	6.39
	2	4.29	0	0.92	5.20	3.05	0.16	3.21	8.41
	3	5.76	0	0.73	6.49	2.73	1.71	4.44	10.93
Dec.	1	7.27	0	0.54	7.81	2.73	0.19	2.92	10.73
	2	3.52	0	0	3.52	0	0	0	3.52
	3	5.71	0	0.07	5.78	0	0.03	0.03	5.81

WSP : wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(23) PRESENT WATER DEMAND

PORONG

Unit : m^3/sec.

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1982									
Jan.	1	3.33	0	0	3.33	0	0	0	3.33
	2	5.01	0	0	5.01	0	0	0	5.01
	3	0.04	0	0	0.04	0	0	0	0.04
Feb.	1	0	0	0	0	0	0	0	0
	2	9.36	0	0	9.36	1.79	0	1.79	11.15
	3	10.53	0	0	10.53	2.23	0	2.23	12.76
Mar.	1	2.20	0	0	2.20	0	0	0	2.20
	2	0	0.10	0.04	0.14	0	0	0	0.14
	3	4.32	0.12	0.05	4.49	0.80	0.01	0.81	5.30
Apr.	1	5.38	2.18	0.90	8.46	2.40	0.02	2.42	10.88
	2	3.75	1.20	7.93	2.33	0	2.33	10.26	
	3	2.19	3.78	1.51	7.48	2.25	0.07	2.32	9.80
May	1	0.68	4.53	1.79	7.00	1.98	02.5	2.23	9.23
	2	0	5.27	2.08	7.35	1.77	0.04	1.81	9.16
	3	0	6.10	2.39	8.49	1.57	0.41	1.98	10.47
Jun.	1	0	4.92	1.89	6.81	1.38	0.48	1.86	8.67
	2	0	5.03	1.93	6.96	1.28	0.54	1.82	8.78
	3	0	5.12	1.97	7.09	1.19	0.58	1.77	8.86
Jul.	1	0	5.06	1.95	7.01	1.09	0.61	1.70	8.81
	2	0	5.03	1.93	6.96	1.05	0.72	1.77	8.73
	3	0	4.29	1.64	5.93	0.87	0.83	1.70	7.63
Aug.	1	0	3.77	1.45	5.22	1.08	1.00	2.08	7 .30
	2	0	2.88	1.10	3.98	1.13	1.33	2.46	6.44
	3	0	2.01	0.77	2.78	1.18	1.68	2.86	5.64
Sept.	1	0	1.30	0.50	1.80	1.53	2.33	3.86	5.66
	2	0	0.42	0.16	0.58	1.76	2.57	4.33	4.91
	3	0	0	0	0	1.99	2.78	4.77	4.77
Oct.	1	0	0	0	0	2.52	3.44	5.96	5.96
	2	0	0	0	0	2.67	3.33	6.00	6.00
	3	0	0	0	0	2.18	0	2.81	2.81
Nov.	1	0	0	0	0	2.94	2.23	5.17	5.17
	2	0	0	0	0	3.05	0.18	3.23	3.23
	3	0	0	0	0	2.73	2.21	4.94	4.94
Dec.	1	0.3	0	0	0.3	2.73	0.31	3.04	3.34
	2	0.41	0	0	0.41	0	0	0	0.41
	3	5.54	0	0	5.54	0	0.09	0.09	5.63

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14 (24) PRESENT WATER DEMAND

PORONG

Unit : $m^3/sec.$

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1983									
Jan.	1	5.35	0	0	5.35	0	0	0	5.35
	2	5.90	0	0	5.90	0	0	0	5.90
	3	5.03	0	0	5.03	0	0	0	5.03
Feb.	1	4.95	0	0	4.95	0	0	0	4.95
	2	9.27	0	0	9.27	1.79	0	1.79	11.06
	3	10.92	0	0	10.92	2.23	0.01	2.24	13.16
Mar.	1	2.77	0	0	2.77	0	0	0	2.77
	2	0	0	0	0	0	0	0	0
	3	7.84	0	0	7.84	0.80	0.02	0.82	8.66
Apr.	1	12.12	0	0	12.12	2.40	0.04	2.44	14.56
	2	10.54	0	0	10.54	2.33	0	2.33	12.87
	3	8.04	0	0.06	8.10	2.25	0.03	2.28	10.38
May	1	5.42	0.13	0.08	5.63	1.98	0.08	2.06	7.69
	2	3.16	0.18	1.29	4.63	1.77	0.02	1.79	6.42
	3	1.02	2.69	1.70	5.41	1.57	0.23	1.80	7.21
Jun.	1	0	3.59	2.12	5.71	1.38	0.29	1.67	7.38
	2	0	4.48	2.50	6.98	1.27	0.41	1.68	8.66
	3	0	5.28	2.93	8.21	1.16	0.51	1.67	9.88
Jul.	1	0	6.12	2.19	8.31	1.05	0.60	1.65	9.96
	2	0	4.62	2.25	6.87	0.99	0.71	1.70	8.59
	3	0	4.51	2.20	6.71	0.81	0.84	1.65	8.36
Aug.	1	0	5.07	2.44	7.51	0.98	1.02	2.00	9.51
	2	0	5.15	2.44	7.59	1.01	1.13	2.14	9.73
	3	0	5.15	2.40	7.55	1.04	1.25	2.29	9.84
Sept.	1	0	5.67	2.33	8.00	1.33	1.55	2.88	10.88
	2	0	4.93	1.78	6.71	1.53	2.07	3.60	10.31
	3	0	3.76	1.24	5.00	1.73	2.59	4,32	9,32
Oct.	1	0	2.89	0.80	3.69	2.19	3.48	5.67	9.36
	2	0	1.68	0.26	1.94	2.32	3.48	5.80	7.74
	3	0	0.54	0	0.54	2.45	0	2.45	2.99
Nov.	1	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-
Dec.	1	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(25) PRESENT WATER DEMAND

MANGETAN AREA

Unit : m^3/sec.

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1981									
Jan.	1	5.39	0	0	5.39	0	0	0	5.39
	2	7.08	0	0	7.08	0	0	0	7.08
	3	13.02	0	0	13.02	0.12	0	0.12	13.14
Feb.	1	4.99	0	0	4.99	0	0	0	4.99
	2	0.22	0	0	0.22	0	0	0	0.22
	3	13.11	0	0	13.11	0.2	0.22	0.42	13.53
Mar.	1	8.03	0	0	8.03	0	0	0	8.03
	2	5.84	0	0	5.84	0	0	0	5.84
	3	12.69	0.07	0.11	12.87	0.27	0.85	1.12	13.99
Apr.	1	12.97	0.11	0.17	13.24	0.39	1.94	2.33	15.57
	2	6.84	1.55	2.4	10.79	0.14	0.18	0.32	11.11
	3	6.22	2.04	3.15	11.40	0.22	0.92	1.14	12.54
May	1	5.39	2.78	4.29	12.45	0.32	2.16	2.48	14.93
	2	2.04	2.67	4.12	8.83	0.10	0.30	0.40	9.23
	3	1.01	3.95	6.11	11.08	0.25	2.33	2.58	13.66
Jun.	1	0	4.47	6.90	11.37	0.28	2.38	2.66	14.03
	2	0	5.07	7.84	12.91	0.40	2.33	2.73	15.64
	3	0	4.20	6.49	10.69	0.52	2.27	2.79	13.48
Jul.	1	0	4.20	6.49	10.69	0.64	2.16	2.80	13.49
	2	0	4.24	6.56	10.80	0.79	2.16	2.95	13.75
	3	0	4.23	6.54	10.78	0.98	2.19	3.17	13.95
Aug.	1	0	4.01	6.20	10.21	1.26	2.33	3.59	13.80
	2	0	3.38	5.22	8.60	1.52	2.61	4.13	12.73
	3	0	2.73	4.22	6.95	1.78	2.88	4.66	11.61
Sept.	1	0	2.33	3.60	5.93	2.42	3.72	6.14	12.07
	2	0	1.62	2.51	4.13	2.77	3.95	6.72	10.85
	3	0	0.95	1.46	2.41	3.14	4.14	7.28	9.69
Oct.	1	0.20	0.34	0.52	1.05	3.98	4.96	8.94	10.0
	2	0.28	0	0	0.28	4.22	4.22	8.44	8.72
	3	3.90	0	0	3.90	0.38	0	0.38	4.28
Nov.	1	5.82	0	0	5.82	3.73	1.97	5.70	11.52
	2	6.09	0	0	6.09	1.85	0.12	1.97	8.06
	3	9.18	0	0	9.18	4.32	1.12	5.44	14.62
Dec.	1	8.18	0	0	8.18	1.98	0.08	2.06	10.24
	2	3.65	0	0	3.65	0	0	0	3.65
	3	10.27	0	0	10.27	1.89	0.01	1.90	12.17

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(26) PRESENT WATER DEMAND

MANGETAN AREA

Unit : m^3/sec.

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1982									
Jan.	1	3.65	0	0	3.65	0	0	0	3.65
	2	5.74	0	0	5.74	0	0	0	5.74
	3	11.70	0	0	11.7	1.14	0	1.14	12.84
Feb.	1	0.04	0	0	0.04	0	0	0	0.04
	2	0.24	0	0	0.24	0	0	0	0.24
	3	10.49	0	0	10.49	1.92	0	1.92	12.41
Mar.	1	5.72	0.07	0	5.79	0.04	0	0.04	5.83
	2	4.03	0.1	0.08	4.21	0	0	0	4.21
	3	8.7	1.51	0.1	10.31	2.62	0.01	2.63	12.94
Apr.	1	8.86	2.1	1.82	12.78	3.79	0.04	3.83	16.61
	2	4.65	2.13	2.08	8.86	1.42	0	1.42	10.28
	3	4.23	2.75	2.68	9.66	2.14	0.03	2.17	11.83
May	1	3.68	3.68	2.62	10.97	3.12	0.11	3.23	14.20
	2	1.39	3.25	3.32	7.96	1.00	0.03	1.03	8.99
	3	0.7	4.82	4.91	10.43	2.48	0.38	2.86	13.29
Jun.	1	0	5.3	5.54	10.84	2.17	0.51	2.68	13.52
	2	0	5.85	6.14	11.99	2.01	0.65	2.66	14.65
	3	0	6.19	6.77	12.96	1.86	0.75	2.61	15.57
Jul.	1	0	6.67	6.26	12.93	1.68	0.84	2.52	15.45
	2	0	6.69	6.28	12.97	1.59	0.92	2.51	15.48
	3	0	5.15	5.91	11.06	1.55	0.95	2.50	13.56
Aug.	1	0	4.26	4.91	9.17	1.62	1.16	2.78	11.95
	2	0	3.69	4.26	7.94	1.66	1.50	3.16	11.10
	3	0	3.09	3.58	6.68	1.72	1.77	3.49	10.17
Sept.	1	0	2.79	3.24	6.04	2.22	2.43	4.65	10.69
	2	0	2.13	2.47	4.6	2.55	2.72	5.27	9.87
	3	0	1.48	1.72	3.2	2.88	3.01	5.89	9.09
Oct.	1	0	0.96	1.11	2.06	3.66	3.70	7.36	9.42
	2	0	0.31	0.36	0.67	3.87	3.62	7.49	8.16
	3	0	0	0	0	0.35	0	0.35	0.35
Nov.	1	0	0	0	0	3.43	2.36	5.79	5.79
	2	0	0	0	0	1.70	0.18	1.88	1.88
	3	0.31	0	0	0.31	3.97	1.95	5.92	6.23
Dec.	1	0.42	0	0	0.42	1.82	0.23	2.05	2.47
	2	5.48	0	0	7.54	1.74	0.04	1.78	9.32
	3	7.54	0	0	7.54	1.74	0.04	1.78	9.32

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Season Paddy

Table 14(27) PRESENT WATER DEMAND

MANGETAN AREA

Unit : m^3/sec.

Year / Month	Ten Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
1983									
Jan.	1	5.55	0	0	5.55	0	0	0	5.55
	2	6.31	0	0	6.31	0	0	0	6.31
	3	10.84	0	0	10.84	1.05	0	1.05	11.89
Feb.	1	5.24	0	0	5.24	0	0	0	5.24
	2	5.13	0	0	5.13	0	0	0	5.13
	3	11.75	0	0	11.75	1.77	0	1.77	13.52
Mar.	1	7.35	0	0	7.35	0.04	0	0.04	7.39
	2	6.16	0	0	6.16	0	0	0	6.16
	3	14.97	0	0	14.97	2.41	0.01	2.42	17.39
Apr.	1	17.93	0	0	17.93	3.48	0.02	3.5	21.43
	2	10.75	0	0	10.75	1.3	0	1.3	12.05
	3	10.76	0.14	0	10.9	1.97	0.01	1.98	12.88
May	1	10.69	0.19	0.09	10.97	2.87	0.02	2.89	13.86
	2	5.43	2.8	0.13	8.36	0.92	0.01	0.93	9.29
	3	5.69	3.93	1.99	11.61	2.27	0.13	2.40	14.01
Jun.	1	3.27	4.9	2.67	10.84	1.99	0.21	2.20	13.04
	2	1.06	5.91	3.34	10.31	1.81	0.40	2.21	12.52
	3	0	6.81	4.03	10.84	1.66	0.59	2.25	13.09
Jul.	1	0	7.75	4.71	12.46	1.48	0.91	2.39	14.85
	2	0	6.12	5.35	11.47	1.38	1.09	2.47	13.94
	3	0	6.28	6.06	12.34	1.31	1.21	2.52	14.86
Aug.	1	0	6.66	5.18	11.48	1.33	1.27	2.60	14.44
	2	0	6.75	5.27	12.02	1.33	1.44	2.77	14.79
	3	0	6.75	5.33	12.08	1.79	1.66	3.45	15.53
Sept.	1	0	7.48	5.96	13.44	1.73	2.13	3.86	17.30
	2	0	6.66	5.45	12.11	1.98	2.33	4.31	16.42
	3	0	5.37	4.59	9.96	2.24	2.59	4.83	14.79
Oct.	1	0	4.53	4.1	8.63	2.58	3.33	6.18	14.81
	2	0	3.15	3.12	6.27	3.01	3.40	6.41	12.68
	3	0	0.8	0.99	1.79	0.27	0	0.27	2.06
Nov.	1	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-
Dec.	1	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-

WSP : Wet Season Paddy
DSP : Dry Season Paddy
UDSP : Unlicenced Dry Sesaon Paddy

Table 14(28) PRESENT WATER DEMAND

PAPAR-PETERONGAN

Unit: m^3/sec

Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
	1	15.92	0		15.92	1.73	0	1.73	17.65
Jan.	2	18.29	0		18.29	1.73	0	1.73	20.02
	3	20.39	0		20.39	1.73	0	1.73	22.12
	1	22.09	0		22.09	1.80	0	1.80	23.89
Feb.	2	0.04	0		0.04	0	0	0	0.04
	3	0	0.10		0.10	0	0	0	0.10
	1	8.58	0.11		8.69	0.08	0	0.08	8.77
Mar.	2	0	1.41		1.41	0	0	0	1.41
	3	0	1.42		1.42	0	0	0	1.42
	1	7.28	2.72		10.00	0.60	0	0.60	10.60
Apr.	2	7.80	4.11		11.91	1.53	0.17	1.70	13.61
	3	5.44	4.94		10.38	1.47	0.46	1.93	12.31
	1	2.98	5.45		8.43	1.17	0.69	1.86	10.29
May	2	0.97	6.23		7.20	1.05	1.20	2.25	9.45
	3	0	5.43		5.43	0.93	1.83	2.76	8.19
	1	0	4.12		4.12	0.26	0.23	0.49	4.61
Jun.	2	0	5.35		5.35	0.73	3.09	3.82	9.17
	3	0	4.93		4.93	0.69	3.55	4.24	9.17
	1	0	4.29		4.29	0.71	3.92	4.63	8.92
Jul.	2	0	3.69		3.69	0.69	3.25	3.94	7.63
	3	0	2.97		2.97	0.67	2.73	3.40	6.37
	1	0	2.45		2.45	0.79	2.98	3.77	6.22
Aug.	2	0	1.70		1.70	0.83	2.24	3.07	4.77
	3	0	0.99		0.99	0.85	1.35	2.20	3.19
	1	0	0.56		0.56	1.05	1.10	2.15	2.71
Sept.	2	0	0.58		0.58	1.21	0.66	1.87	2.45
	3	0	0.59		0.59	1.37	0.07	1.44	2.03
	1	0	0.59		0.59	1.55	0	1.55	2.14
Oct.	2	0	0.59		0.59	1.65	0	1.65	2.24
	3	0.19	0.51		0.70	1.73	0	1.73	2.43
	1	0.30	0.38		0.68	1.69	0	1.69	2.37
Nov.	2	5.09	0.26		5.35	1.75	0	1.75	7.10
	3	7.33	0.15		7.48	1.79	0	1.79	9.27
	1	6.48	0.02		6.50	0	0	0	6.50
Dec.	2	4.07	0		4.07	0	0	0	4.07
	3	4.03	0		4.03	0	0	0	4.03

Note: Water requirement is estimated based on the present cropping patterns of Irrigation Sections, Jombang and Kediri. Polowijo crop II is assumed not to be irrigated.

Table 15(1) FUTURE WATER DEMAND

MOLEK AREA (3,991 ha)

Unit: m^3/sec

Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
	1	0	0		0	0	0	0	0
Jan.	2	1.29	0		1.29	0	0	0	1.29
	3	0	0		0	0	0	0	0
	1	0	0.07	0.02	0.09	0	0	0	0.09
Feb.	2	1.34	0.10	0.03	1.47	0	0	0	1.47
	3	3.29	1.62	0.39	5.30	0.15	0	0.15	5.45
	1	2.53	2.13	0.52	5.18	0.15	0	0.15	5.33
Mar.	2	1.07	2.13	0.51	3.71	0.03	0	0.03	3.74
	3	0.83	2.86	0.69	4.38	0.09	0	0.09	4.47
	1	0.24	3.13	0.75	4.12	0.07	0	0.07	4.19
Apr.	2	0	4.62	1.11	5.73	0.16	0	0.16	5.89
	3	0	1.32	0.32	1.64	0	0	0	1.64
	1	0	2.97	0.72	3.69	0.07	0	0.07	3.76
May	2	0	1.70	0.41	2.11	0	0	0	2.11
	3	0	3.32	0.80	4.12	0.07	0	0.07	4.19
	1	0	3.22	0.78	4.00	0.06	0	0.06	4.06
Jun.	2	0	2.74	0.66	3.40	0.04	0	0.04	3.44
	3	0	2.79	0.67	3.46	0.09	0	0.09	3.55
	1	0	2.17	0.52	2.69	0.08	0.07	0.15	2.84
Jul.	2	0	1.27	0.31	1.58	0.04	0.03	0.07	1.65
	3	0	0.89	0.21	1.10	0.07	0.39	0.46	1.56
	1	0	0.31	0.07	0.38	0.09	0.73	0.82	1.20
Aug.	2	0	0		0	0.08	1.12	1.20	1.20
	3	0	0		0	0.09	1.55	1.64	1.64
	1	0	0		0	0.11	2.12	2.23	2.23
Sept.	2	0	0		0	0.13	2.42	2.55	2.55
	3	0	0		0	0.14	2.57	2.71	2.71
	1	0.09	0		0.09	0.14	2.06	2.20	2.29
Oct.	2	0.13	0		0.13	0.05	0.59	0.64	0.77
	3	1.88	0		1.88	0.06	0.39	0.45	2.33
	1	2.14	0		2.14	0	0	0	2.14
Nov.	2	3.21	0		3.21	0.12	0.20	0.32	3.53
	3	2.65	0		2.65	0	0	0	2.65
	1	2.55	0		2.55	0	0	0	2.55
Dec.	2	1.54	0		1.54	0	0	0	1.54
	3	0.02	0		0.02	0	0	0	0.02

WSP = Wet Season Paddy
DSP = Dry Season Paddy
UDSP = Unlicenced Dry Season Paddy

Table 15(2) FUTURE WATER DEMAND

LODOYO AREA (15,228 Ha)

Unit: m^3/sec

Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
	1	10.53	0		10.53	0	0	0	10.53
Jan.	2	3.85	0		3.85	0	0	0	3.85
	3	13.33	0		13.33	0	0	0	13.33
	1	8.58	0		8.58	0	0	0	8.58
Feb.	2	21.66	0.09		21.75	1.81	0	1.81	23.56
	3	20.40	0.15		20.55	1.80	0	1.80	22.35
	1	0	1.76		1.76	0	0	0	1.76
Mar.	2	4.77	1.83		6.60	0	0	0	6.60
	3	4.61	2.00		6.61	0	0	0	6.61
	1	6.76	3.22		9.98	0.33	0	0.33	10.31
Apr.	2	7.81	5.19		13.00	1.50	1.41	2.91	15.91
	3	5.47	6.02		11.49	1.45	1.95	3.40	14.89
	1	3.18	6.80		9.98	1.30	2.44	3.74	13.72
May	2	1.03	7.55		8.58	1.16	2.97	4.13	12.71
	3	0	8.33		8.33	1.03	3.40	4.43	12.76
	1	0	7.08		7.08	0.91	3.40	4.31	11.39
Jun.	2	0	7.11		7.11	0.84	3.20	4.04	11.15
	3	0	6.69		6.69	0.78	2.94	3.72	10.41
	1	0	5.83		5.83	0.71	2.49	3.20	9.03
Jul.	2	0	5.06		5.06	0.69	2.17	2.86	7.92
	3	0	4.26		4.26	0.68	1.99	2.67	6.93
	1	0	3.79		3.79	0.78	2.19	2.97	6.76
Aug.	2	0	2.89		2.89	0.81	2.35	3.16	6.05
	3	0	1.81		1.81	0.63	1.94	2.57	4.38
	1	0	1.21		1.21	0.99	3.89	4.88	6.09
Sept.	2	0	0.39		0.39	1.13	4.98	6.11	6.50
	3	0	0		0	1.28	6.05	7.33	7.33
	1	0	0		0	0.97	4.50	5.47	5.47
Oct.	2	0.21	0		0.21	1.33	6.14	7.47	7.68
	3	0.27	0		0.27	1.32	5.41	6.73	7.00
	1	4.97	0		4.97	0	0	5.63	10.60
Nov.	2	4.07	0		4.07	0	0	0	4.07
	3	4.07	0		4.07	0	0	0	4.07
	1	11.87	0		11.87	1.76	3.16	4.92	16.79
Dec.	2	12.96	0		12.96	1.33	1.38	2.71	15.67
	3	15.32	0		15.32	1.41	0.71	2.12	17.44

Table 15(3) FUTURE WATER DEMAND

WARUJAYENG AREA (13,476 Ha)

Unit: m^3/sec

Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
	1	5.21	0		5.21	0	0	0	5.21
Jan.	2	0.96	0		0.96	0	0	0	0.96
	3	9.47	0		9.47	0.03	0	0.03	9.50
	1	12.70	0		12.70	0.38	0	0.38	13.08
Feb.	2	8.02	0.29		8.30	0	0	0	8.30
	3	2.86	0.45		3.30	0	0	0	3.30
	1	0	5.32		5.32	0	0	0	5.32
Mar.	2	1.92	6.18		8.10	0	0	0	8.10
	3	2.28	8.78		11.06	0.14	0	0.14	11.20
	1	1.22	13.82		15.04	0.77	0	0.77	15.81
Apr.	2	0	17.36		17.36	0.93	0	0.93	18.29
	3	0	15.20		15.20	0.29	0	0.29	15.49
	1	0	15.33		15.33	0.69	0	0.69	16.02
May	2	0	17.41		17.41	0.86	0	0.86	18.27
	3	0	17.46		17.46	0.79	0	0.79	18.25
	1	0	15.36		15.36	0.68	0	0.68	16.04
Jun.	2	0	12.51		12.51	0.60	0	0.60	13.11
	3	0	9.60		9.60	0.54	0.21	0.75	10.35
	1	0	6.89		6.89	0.52	0.67	1.19	8.08
Jul.	2	0	4.02		4.02	0.49	1.23	1.72	5.74
	3	0	1.30		1.30	0.46	2.09	2.55	3.85
	1	0	0		0	0.51	3.70	4.21	4.21
Aug.	2	0	0		0	0.50	5.11	5.61	5.61
	3	0	0		0	0.51	6.53	7.04	7.04
	1	0	0		0	0.60	8.48	9.08	9.08
Sept.	2	0	0		0	0.62	9.04	9.66	9.66
	3	0	0		0	0.69	7.99	8.68	8.68
	1	0	0		0	0.80	6.46	8.06	8.06
Oct.	2	0	0		0	0.90	4.82	5.72	5.72
	3	0.27	0		0.27	0	0	0	0.27
	1	0.42	0		0.42	1.00	1.56	2.56	2.98
Nov.	2	6.59	0		6.59	0.42	0	0.42	7.01
	3	6.78	0		6.78	0	0	0	6.78
	1	10.97	0		10.97	0.52	0	0.52	11.49
Dec.	2	15.18	0		15.18	0.88	0	0.88	16.06
	3	19.20	0		19.20	1.09	0	1.09	20.29

Table 15(4) FUTURE WATER DEMAND

TURI TUNGGORONO AREA (9,867 Ha)

Unit: m^3/sec

Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
	1	12.48	0		12.48	0.98	0	0.98	13.46
Jan.	2	14.53	0		14.53	0.98	0	0.98	15.51
	3	12.24	0		12.24	0.99	0	0.99	13.23
	1	12.79	0		12.79	1.04	0	1.04	13.83
Feb.	2	0	0		0	0	0	0	0
	3	0	0.25		0.25	0	0	0	0.25
	1	4.34	0.28		4.61	0.06	0	0.06	4.67
Mar.	2	0	3.65		3.65	0	0	0	3.65
	3	0	3.66		3.66	0	0	0	3.66
	1	1.84	6.43		8.27	0.38	0	0.38	8.65
Apr.	2	0.91	9.74		10.65	0.93	0	0.93	11.58
	3	0	11.44		11.44	0.90	0	0.90	12.34
	1	0	12.46		12.46	0.76	0	0.76	13.22
May	2	0	10.20		10.20	0.74	0	0.74	10.94
	3	0	10.34		10.34	0.68	0	0.68	11.02
	1	0	7.39		7.39	0.21	0	0.21	7.60
Jun.	2	0	9.07		9.07	0.51	0	0.51	9.58
	3	0	7.39		7.39	0.45	0	0.45	7.84
	1	0	6.04		6.04	0.47	0.14	0.61	6.65
Jul.	2	0	4.21		4.21	0.43	0.43	0.86	5.07
	3	0	2.46		2.46	0.41	0.79	1.20	3.66
	1	0	0.87		0.87	0.46	1.57	2.03	2.90
Aug.	2	0	0		0	0.45	2.40	2.85	2.85
	3	0	0		0	0.46	3.32	3.78	3.78
	1	0	0		0	0.53	4.68	5.21	5.21
Sept.	2	0	0		0	0.55	5.34	5.89	5.89
	3	0	0		0	0.61	5.69	6.30	6.30
	1	0	0		0	0.71	5.13	5.84	5.84
Oct.	2	0	0		0	0.81	4.15	4.96	4.96
	3	0	0		0	0.90	3.10	4.00	4.00
	1	0.21	0		0.21	0.88	1.90	2.78	2.99
Nov.	2	0.30	0		0.30	0.92	0.98	1.90	2.20
	3	4.88	0		4.88	0.97	0.26	1.23	6.11
	1	4.99	0		4.99	0	0	0	4.99
Dec.	2	3.99	0		3.99	0	0	0	3.99
	3	5.65	0		5.65	0	0	0	5.65

Table 15(5) FUTURE WATER DEMAND

PAPAR PETERONGAN (14,700 Ha)

Year : 1969 Unit : m3/sec.

Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-	Total
Jan	1	19.34	0		19.34	1.74	0	1.74	21.08
	2	19.78	0		19.78	1.75	0	1.75	21.53
	3	20.11	0		20.11	1.75	0	1.75	21.86
Feb	1	19.68	0		19.68	1.68	0	1.68	21.36
	2	0	0.20		0.20	0	0	0	0.20
	3	0	0.36		0.36	0	0	0	0.36
Mar	1	7.34	4.92		12.26	0.11	0	0.11	12.37
	2	0	4.46		4.46	0	0	0	4.46
	3	0	4.43		4.43	0	0	0	4.43
Apr	1	3.21	10.22		13.43	0.71	0	0.71	14.14
	2	1.50	15.15		16.65	1.61	0.69	2.30	18.95
	3	0	12.62		12.62	1.56	1.27	2.83	15.45
May	1	0	12.10		12.10	1.29	1.79	3.08	15.18
	2	0	12.35		12.35	1.15	2.45	3.60	15.95
	3	0	12.51		12.51	1.02	3.07	4.09	16.60
Jun	1	0	9.45		9.45	0.36	1.66	2.02	11.47
	2	0	11.99		11.99	0.82	3.33	4.15	16.14
	3	0	10.49		10.49	0.76	3.10	3.86	14.35
Jul	1	0	8.25		8.25	0.74	2.24	2.98	11.23
	2	0	5.77		5.77	0.71	1.15	1.86	7.63
	3	0	3.38		3.38	0.70	0.30	1.00	4.38
Aug	1	0	1.20		1.20	0.82	0	0.82	2.02
	2	0	0		0	0.85	0	0.85	0.85
	3	0	0		0	0.89	0	0.89	0.89
Sep	1	0	0		0	1.12	0	1.12	1.12
	2	0	0		0	1.29	0	1.29	1.29
	3	0	0		0	1.46	0	1.46	1.46
Oct	1	0	0		0	1.62	0	1.62	1.62
	2	0.31	0		0.31	1.72	0	1.72	2.03
	3	0.40	0		0.40	1.81	0	1.81	2.21
Nov	1	7.33	0		7.33	1.80	0	1.80	9.13
	2	10.58	0		10.58	1.86	0	1.86	12.44
	3	13.88	0		13.88	1.91	0	1.91	15.79
Dec	1	10.91	0		10.91	0.13	0	0.13	11.04
	2	5.52	0		5.52	0	0	0	5.52
	3	11.85	0		11.85	0	0	0	11.85

Table 15(6) FUTURE WATER DEMAND

JATIMLEREK-BUNDER AREA (1,076 Ha)

Unit: m^3/sec

Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
	1	1.16	0	0	1.16	0.17	0	0.18	1.34
Jan.	2	1.20	0	0	1.20	0.17	0	0.17	1.37
	3	1.24	0	0	1.24	0.18	0	0.18	1.42
	1	1.30	0	0	1.30	0.18	0	0.18	1.48
Feb.	2	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0
	1	0.60	0.02	0.01	0.64	0.01	0	0.01	0.65
Mar.	2	0	0.03	0.01	0.05	0	0	0	0.05
	3	0	0.45	0.18	0.63	0	0	0	0.63
	1	0.28	0.65	0.24	1.16	0.06	0	0.06	1.22
Apr.	2	0.14	0.95	0.33	1.42	0.15	0	0.15	1.57
	3	0	1.16	0.23	1.39	0.15	0	0.15	1.54
	1	0	0.80	0.25	1.05	0.12	0	0.12	1.17
May	2	0	0.83	0.25	1.08	0.11	0	0.11	1.19
	3	0	0.85	0.26	1.11	0.09	0	0.09	1.20
	1	0	0.63	0.19	0.82	0.03	0	0.03	0.85
Jun.	2	0	0.85	0.26	1.11	0.08	0	0.08	1.19
	3	0	0.84	0.26	1.10	0.07	0	0.07	1.17
	1	0	0.88	0.27	1.15	0.07	0	0.07	1.22
Jul.	2	0	0.74	0.23	0.97	0.07	0	0.07	1.04
	3	0	0.52	0.16	0.68	0.07	0.03	0.10	0.78
	1	0	0.33	0.10	0.44	0.08	0.12	0.20	0.64
Aug.	2	0	0.11	0.02	0.13	0.08	0.22	0.30	0.43
	3	0	0	0	0	0.08	0.34	0.42	0.42
	1	0	0	0	0	0.11	0.52	0.63	0.63
Sept.	2	0	0	0	0	0.12	0.65	0.77	0.77
	3	0	0	0	0	0.14	0.72	0.86	0.86
	1	0	0	0	0	0.16	0.75	0.91	0.91
Oct.	2	0	0	0	0	0.17	0.70	0.87	0.87
	3	0	0	0	0	0.18	0.48	0.66	0.66
	1	0.04	0	0	0.04	0.17	0.23	0.40	0.44
Nov.	2	0.06	0	0	0.06	0.18	0.06	0.24	0.30
	3	0.75	0	0	0.75	0.18	0	0.18	0.93
	1	0.73	0	0	0.73	0	0	0	0.73
Dec.	2	0.56	0	0	0.56	0	0	0	0.56
	3	0.79	0	0	0.79	0	0	0	0.79

Table 15(7) FUTURE WATER DEMAND

JATIKULON AREA (619 Ha)

Unit: m^3/sec

Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
	1	0	0	0	0	0	0	0	0
Jan.	2	0.2	0	0	0.2	0	0	0	0.20
	3	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0
Feb.	2	0.68	0	0	0.68	0.05	0	0.05	0.73
	3	0.74	0	0	0.74	0.06	0	0.06	0.80
	1	0.20	0.02	0.01	0.22	0	0	0	0.22
Mar.	2	0	0.02	0.01	0.03	0	0	0	0.03
	3	0.26	0.33	0.10	0.70	0.01	0	0.01	0.71
	1	0.26	0.5	0.15	0.92	0.06	0	0.06	0.98
Apr.	2	0.08	0.63	0.19	0.91	0.06	0	0.06	0.97
	3	0	0.77	0.13	0.90	0.05	0	0.05	0.95
	1	0	0.53	0.13	0.66	0.04	0	0.04	0.70
May	2	0	0.55	0.13	0.68	0.04	0	0.04	0.72
	3	0	0.56	0.13	0.70	0.03	0	0.03	0.73
	1	0	0.56	0.13	0.69	0.03	0	0.03	0.72
Jun.	2	0	0.56	0.13	0.69	0.02	0	0.02	0.71
	3	0	0.56	0.13	0.69	0.02	0	0.02	0.71
	1	0	0.58	0.13	0.71	0.03	0.02	0.05	0.76
Jul.	2	0	0.49	0.11	0.59	0.02	0.05	0.07	0.66
	3	0	0.33	0.06	0.38	0.02	0.07	0.09	0.47
	1	0	0.22	0.02	0.24	0.03	0.17	0.20	0.44
Aug.	2	0	0.07	0	0.07	0.04	0.26	0.30	0.37
	3	0	0	0	0	0.03	0.32	0.35	0.35
	1	0	0	0	0	0.04	0.42	0.46	0.46
Sept.	2	0	0	0	0	0.04	0.45	0.49	0.49
	3	0	0	0	0	0.05	0.44	0.49	0.49
	1	0	0	0	0	0.06	0.34	0.40	0.40
Oct.	2	0	0	0	0	0.06	0.23	0.29	0.29
	3	0	0	0	0	0.06	0.12	0.18	0.18
	1	0.02	0	0	0.02	0.06	0.03	0.09	0.11
Nov.	2	0.03	0	0	0.03	0.06	0	0.06	0.09
	3	0.45	0	0	0.45	0.06	0	0.06	0.51
	1	0.62	0	0	0.62	0.06	0	0.06	0.68
Dec.	2	0.35	0	0	0.35	0	0	0	0.35
	3	0.56	0	0	0.56	0	0	0	0.56

Table 15(8) FUTURE WATER DEMAND

WONOKROMO AREA (1,150 Ha)

Unit: m^3/sec

Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
	1	0.54	0	0	0.54		0	0	0.54
Jan.	2	0.20	0	0	0.20		0	0	0.20
	3	0.72	0	0	0.72		0	0	0.72
	1	0	0	0	0		0	0	0
Feb.	2	0.07	0	0	0.07		0	0	0.07
	3	0.94	0	0	0.94		0	0	0.94
	1	0.56	0.01	0.01	0.59		0	0	0.59
Mar.	2	0.36	0.02	0.01	0.39		0	0	0.39
	3	0.71	0.28	0.16	1.15		0	0	1.15
	1	0.61	0.39	0.22	1.22		0.01	0.01	1.23
Apr.	2	0.22	0.39	0.22	0.84		0	0	0.84
	3	0.09	0.49	0.28	0.86		0	0	0.86
	1	0	0.66	0.38	1.04		0.09	0.09	1.13
May	2	0	0.34	0.19	0.53		0	0	0.53
	3	0	0.52	0.30	0.82		0.19	0.19	1.01
	1	0	0.53	0.30	0.83		0.22	0.22	1.05
Jun.	2	0	0.54	0.30	0.84		0.25	0.25	1.09
	3	0	0.54	0.30	0.84		0.25	0.25	1.09
	1	0	0.52	0.29	0.81		0.20	0.20	1.01
Jul.	2	0	0.45	0.26	0.71		0.15	0.15	0.86
	3	0	0.34	0.20	0.54		0.10	0.10	0.64
	1	0	0.25	0.14	0.39		0.08	0.08	0.47
Aug.	2	0	0.14	0.08	0.23		0.09	0.10	0.33
	3	0	0.05	0.03	0.07		0.16	0.16	0.23
	1	0	0	0	0		0.31	0.31	0.31
Sept.	2	0	0	0	0		0.47	0.47	0.47
	3	0	0	0	0		0.64	0.64	0.64
	1	0	0	0	0		0.87	0.87	0.87
Oct.	2	0	0	0	0		0.98	0.98	0.98
	3	0	0	0	0		0.13	0.13	0.13
	1	0.03	0	0	0.03		0.64	0.64	0.67
Nov.	2	0.05	0	0	0.05		0.17	0.17	0.22
	3	0.70	0	0	0.70		0.34	0.34	1.04
	1	0.81	0	0	0.81		0.03	0.03	0.84
Dec.	2	0.58	0	0	0.58		0	0	0.58
	3	1.08	0	0	1.08		0	0	1.08

Table 15(7) FUTURE WATER DEMAND

PORONG AREA (12,300 Ha)

Unit: m^3/sec

Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
	1	3.81	0	0	3.81	0	0	0	3.81
Jan.	2	5.22	0	0	5.22	0	0	0	5.22
	3	0.04	0	0	0.04	0	0	0	0.04
	1	0	0	0	0	0	0	0	0
Feb.	2	9.07	0	0	9.07	1.59	0	1.59	10.66
	3	10.29	0	0	10.29	1.97	0	1.97	12.26
	1	2.51	0.10	0.04	2.65	0	0	0	2.65
Mar.	2	0	0.14	0.06	0.20	0	0	0	0.20
	3	4.86	1.96	0.88	7.69	0.71	0	0.71	8.40
	1	6.06	2.85	1.28	10.19	2.12	0.06	2.18	12.37
Apr.	2	4.22	3.59	1.61	9.41	2.06	0.20	2.26	11.67
	3	2.46	4.35	1.95	8.76	1.99	0.36	2.35	11.11
	1	0.77	4.93	2.21	7.92	1.75	0.38	2.33	10.25
May	2	0	5.69	2.55	8.24	1.57	0.89	2.46	10.70
	3	0	4.56	2.04	6.60	1.39	1.23	2.62	9.22
	1	0	4.60	2.06	6.66	1.22	1.53	2.75	9.41
Jun.	2	0	4.68	2.10	6.79	1.13	1.75	2.88	9.67
	3	0	4.71	2.11	6.83	1.05	1.86	2.91	9.74
	1	0	4.59	2.06	6.65	0.97	1.61	2.58	9.23
Jul.	2	0	4.11	1.85	5.96	0.93	1.30	2.23	8.19
	3	0	3.15	1.41	4.56	0.77	0.86	1.63	6.19
	1	0	2.63	1.18	3.80	0.97	0.86	1.83	5.63
Aug.	2	0	1.83	0.82	2.65	0.99	0.88	1.87	4.52
	3	0	1.07	0.48	1.55	1.04	1.07	2.11	3.66
	1	0	0.38	0.17	0.56	1.35	1.93	3.28	3.84
Sept.	2	0	0	0	0	1.55	2.96	4.51	4.51
	3	0	0	0	0	1.76	4.09	5.85	5.85
	1	0	0	0	0	2.23	5.97	8.20	8.20
Oct.	2	0	0	0	0	2.36	6.81	9.17	9.17
	3	0	0	0	0	2.49	7.26	9.75	9.75
	1	0.22	0	0	0.22	2.60	6.41	9.01	9.23
Nov.	2	0.30	0	0	0.30	2.70	5.19	7.89	8.19
	3	4.81	0	0	4.81	2.42	3.27	5.69	10.50
	1	6.51	0	0	6.51	2.42	2.20	4.62	11.13
Dec.	2	4.03	0	0	4.03	0	0	0	4.03
	3	5.81	0	0	5.81	0	0	0	5.81

Table 15(10) FUTURE WATER DEMAND

MANGETAN AREA (16,120 Ha)

Unit: m^3/sec

Month	Ten-Day	WSP	DSP	UDSP	Sub-Total	Sugar-cane	Polo-wijo	Sub-Total	Total
	1	5.04	0	0	5.04	0	0	0	5.04
Jan.	2	6.90	0	0	6.90	0	0	0	6.90
	3	0.05	0	0	0.05	0	0	0	0.05
	1	0	0	0	0	0	0	0	0
Feb.	2	11.99	0	0	11.99	2.01	0	2.01	14.00
	3	13.60	0	0	13.60	2.49	0	2.49	16.09
	1	3.32	0.09	0.10	3.51	0	0	0	3.51
Mar.	2	0	0.13	0.14	0.26	0	0	0	0.26
	3	6.42	1.81	2.01	10.23	0.90	0	0.90	11.13
	1	8.00	2.63	2.93	13.56	2.69	0.09	2.78	16.34
Apr.	2	5.57	3.31	3.68	12.56	2.61	0.27	2.88	15.44
	3	3.25	4.01	4.46	11.72	2.52	0.50	3.02	14.74
	1	1.02	4.55	5.06	10.63	2.21	0.81	3.02	13.65
May	2	0	5.25	5.84	11.09	1.98	1.24	3.22	14.31
	3	0	4.21	4.67	8.88	1.76	1.72	3.48	12.36
	1	0	4.24	4.71	8.96	1.55	2.14	3.69	12.65
Jun.	2	0	4.32	4.80	9.13	1.43	2.44	3.87	13.00
	3	0	4.35	4.83	9.18	1.34	2.60	3.94	13.12
	1	0	4.24	4.71	8.95	1.22	2.25	3.47	12.42
Jul.	2	0	3.80	4.22	8.01	1.17	1.82	2.99	11.00
	3	0	2.91	3.23	6.13	0.98	1.21	2.19	8.32
	1	0	2.42	2.69	5.12	1.22	1.20	2.42	7.54
Aug.	2	0	1.69	1.88	3.56	1.26	1.26	2.52	6.08
	3	0	0.99	1.09	2.08	1.33	1.55	2.88	4.96
	1	0	0.35	0.39	0.75	1.71	2.80	4.51	5.26
Sept.	2	0	0	0	0	1.97	4.28	6.25	6.25
	3	0	0	0	0	2.23	5.91	8.14	8.14
	1	0	0	0	0	2.82	8.63	11.45	11.45
Oct.	2	0	0	0	0	2.99	9.85	12.84	12.84
	3	0	0	0	0	3.15	10.49	13.64	13.64
	1	0.29	0	0	0.29	3.30	9.27	12.57	12.86
Nov.	2	0.40	0	0	0.40	3.42	7.50	10.92	11.32
	3	6.36	0	0	6.36	3.06	4.73	7.79	14.15
	1	8.61	0	0	8.61	3.06	3.19	6.25	14.86
Dec.	2	5.32	0	0	5.32	0	0	0	5.32
	3	7.68	0	0	7.68	0	0	0	7.68

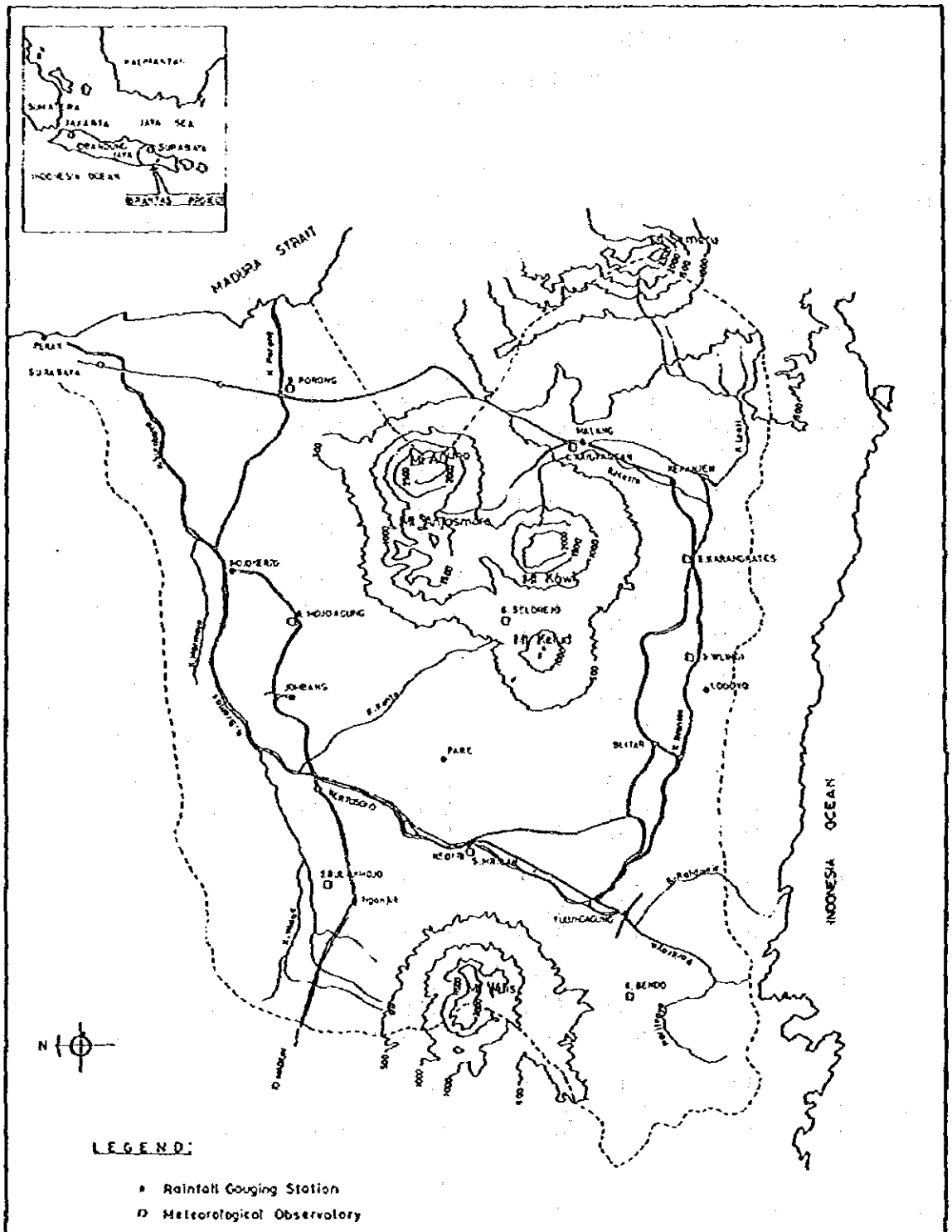


Fig. 1 LOCATION MAP OF METEOROLOGICAL STATIONS USED FOR ESTIMATE OF IRRIGATION REQUIREMENT

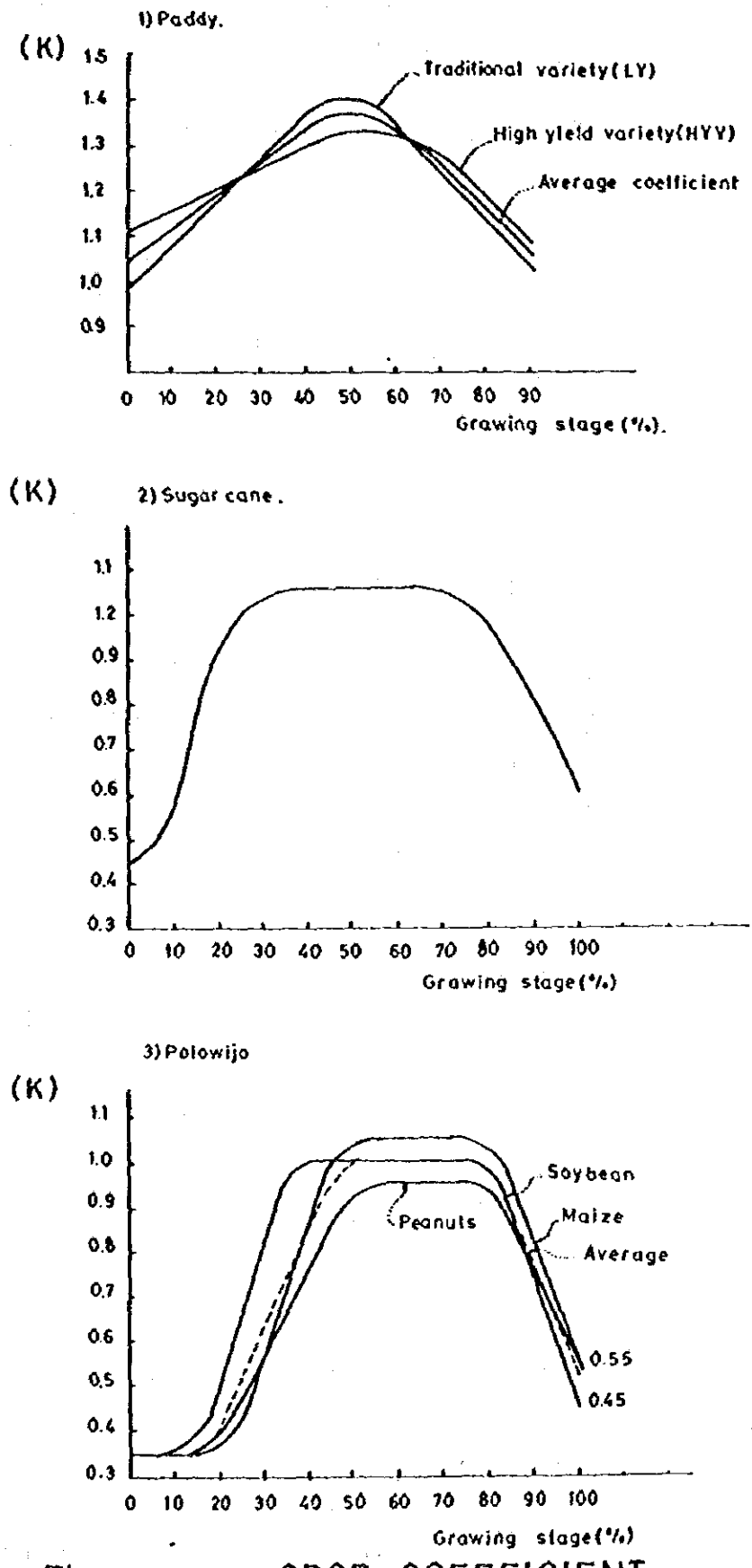
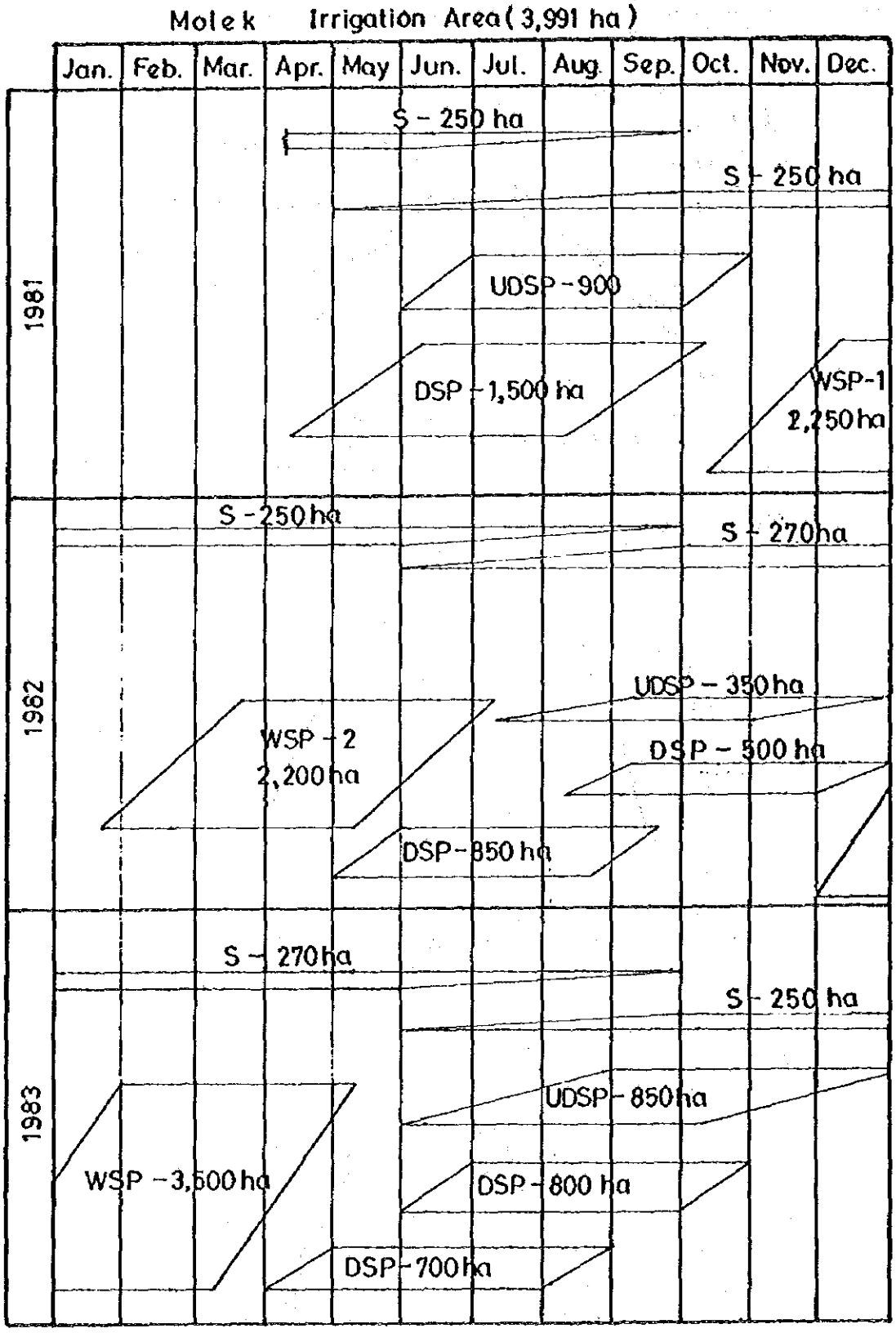


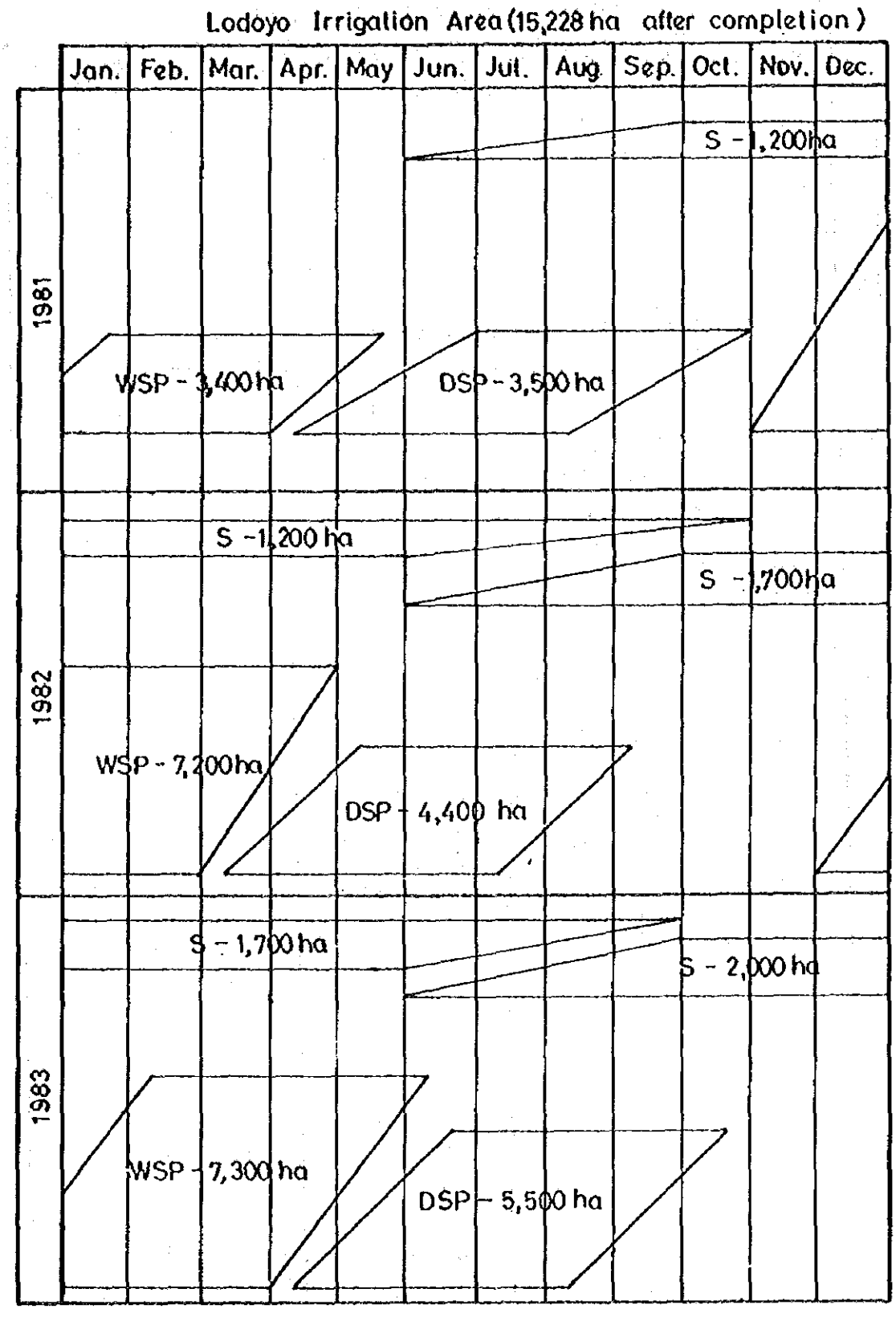
Fig. 2 CROP COEFFICIENT



LEGEND : WSP = Wet season paddy
DSP = Authorized dry season paddy
UDSP = Unlicenced dry season paddy
S = Sugarcane

NOTE : Cropping pattern of polowijo is not illustrated due to no reliable data to estimated the growing stages

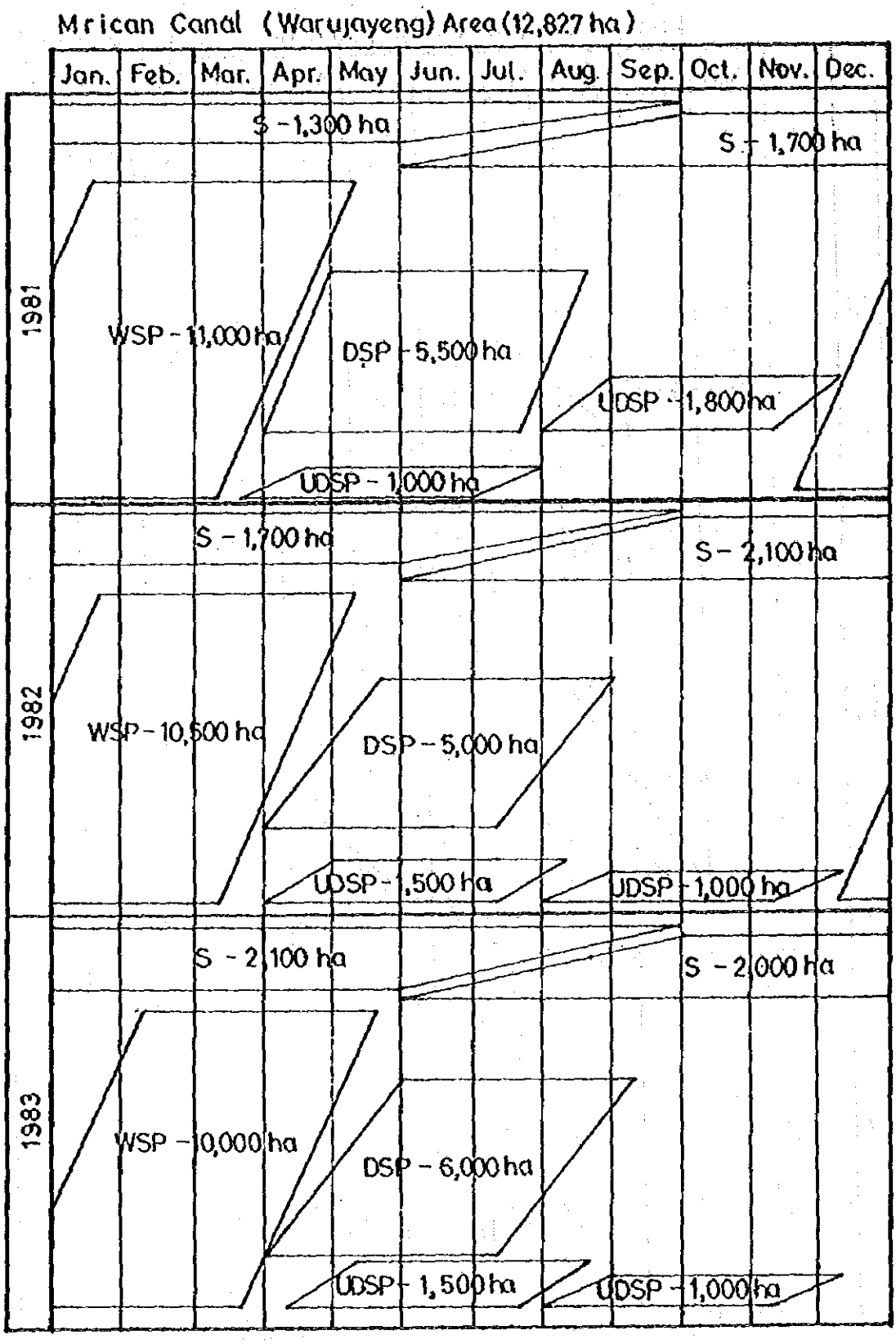
Fig. 3(1) CROPPING PATTERN ESTIMATED FROM PLANTING DATA



LEGEND : WSP = Wet season paddy
DSP = Authorized dry season paddy
UDSP = Unlicenced dry season paddy
S = Sugarcane

NOTE : Cropping pattern of polowijo is not illustrated due to no reliable data to estimated the growing stages

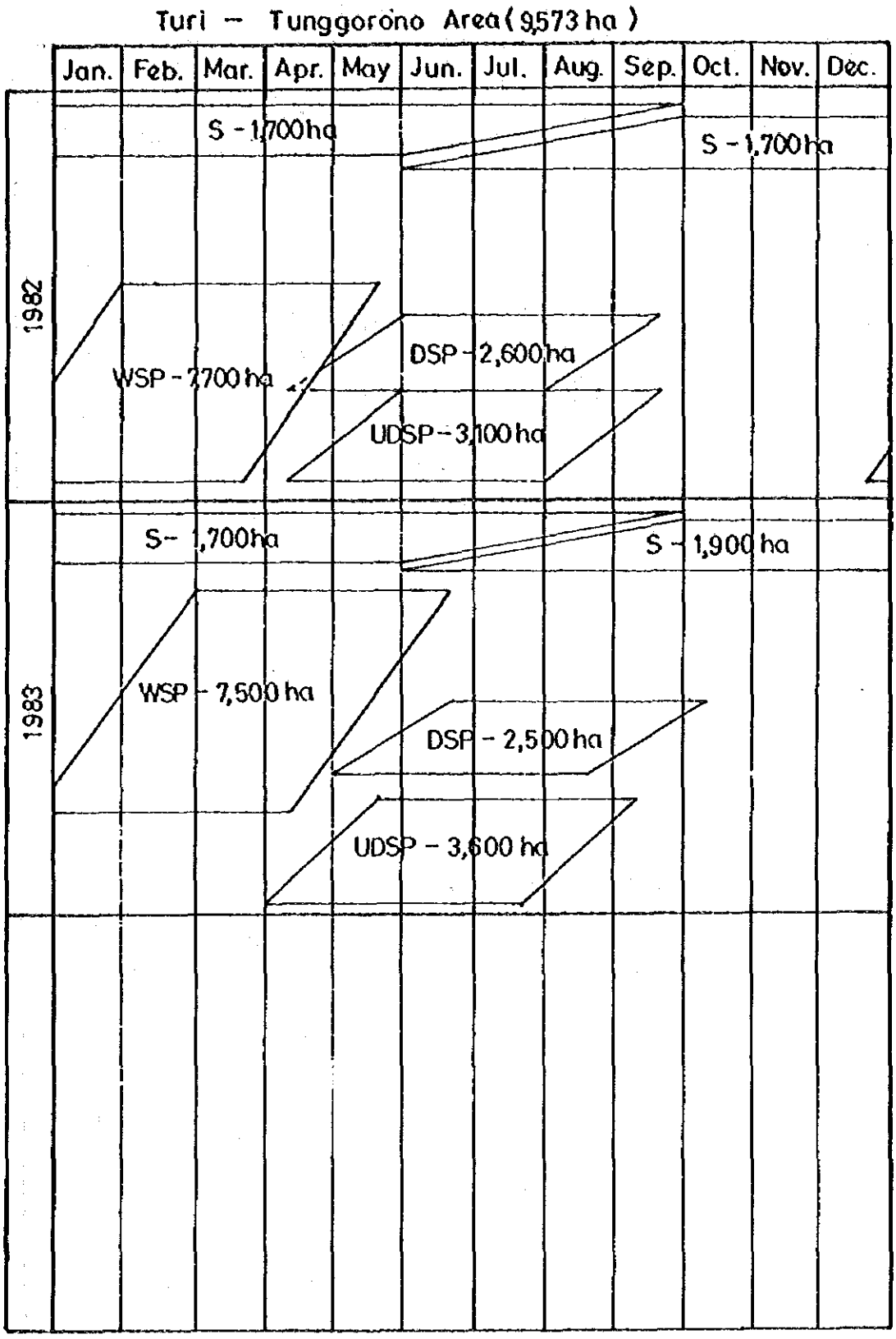
Fig. 3(2) CROPPING PATTERN ESTIMATED FROM PLANTING DATA



LEGEND : WSP = Wet season paddy
DSP = Authorized dry season paddy
UDSP = Unlicenced dry season paddy
S = Sugarcane

NOTE : Cropping pattern of polowijo is not illustrated due to no reliable data to estimated the growing stages

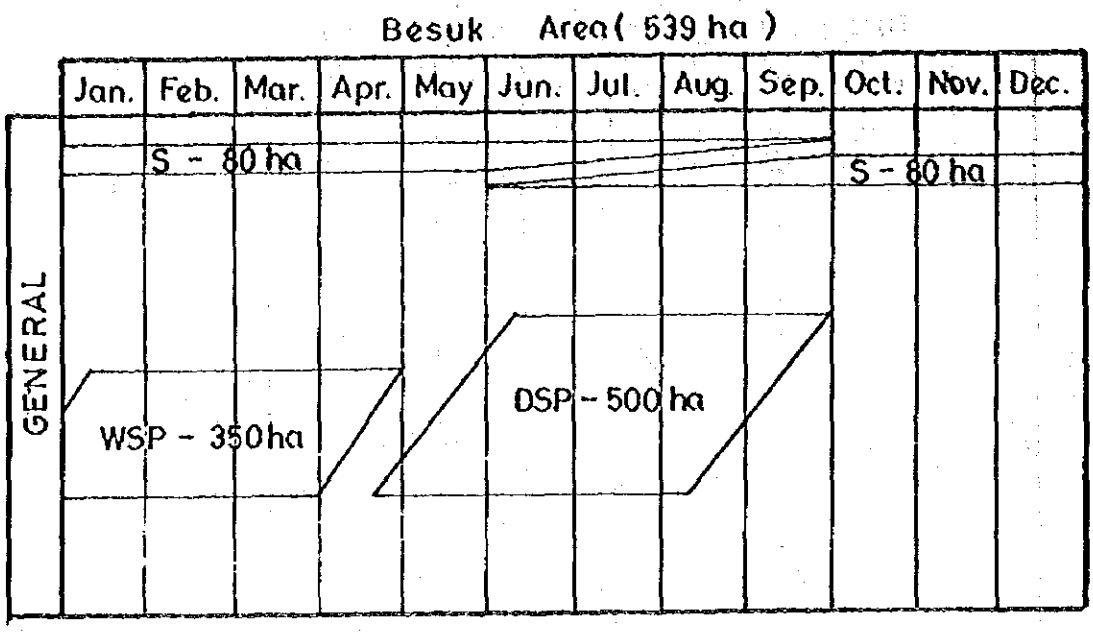
Fig. 3(3) CROPPING PATTERN ESTIMATED FROM PLANTING DATA

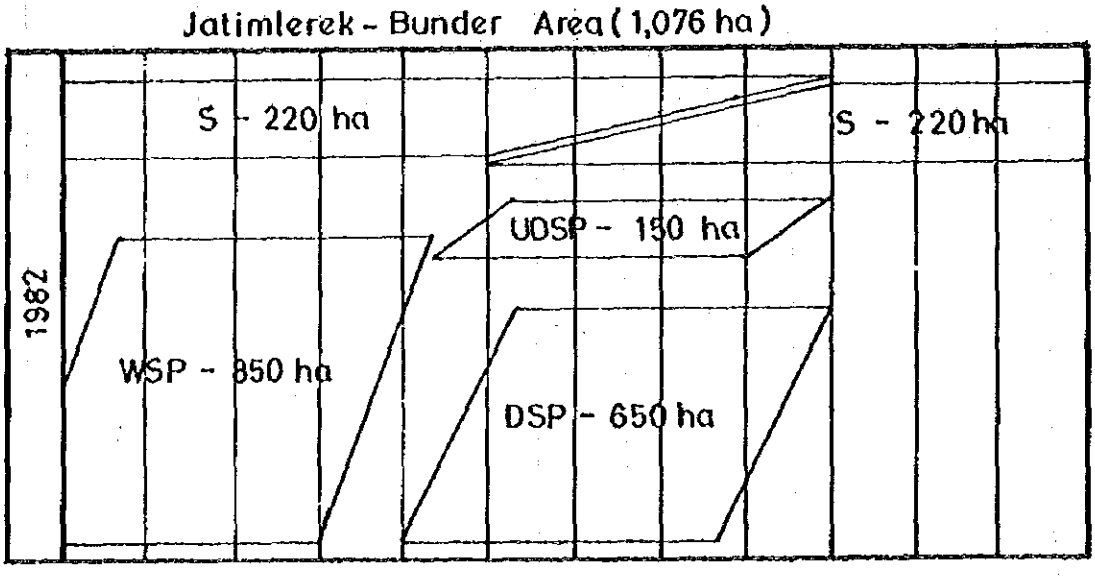


LEGEND : WSP = Wet season paddy
DSP = Authorized dry season paddy
UDSP = Unlicenced dry season paddy
S = Sugarcane

NOTE : Cropping pattern of polowijo is not illustrated due to no reliable data to estimated the growing stages

Fig. 3(4) CROPPING PATTERN ESTIMATED FROM PLANTING DATA



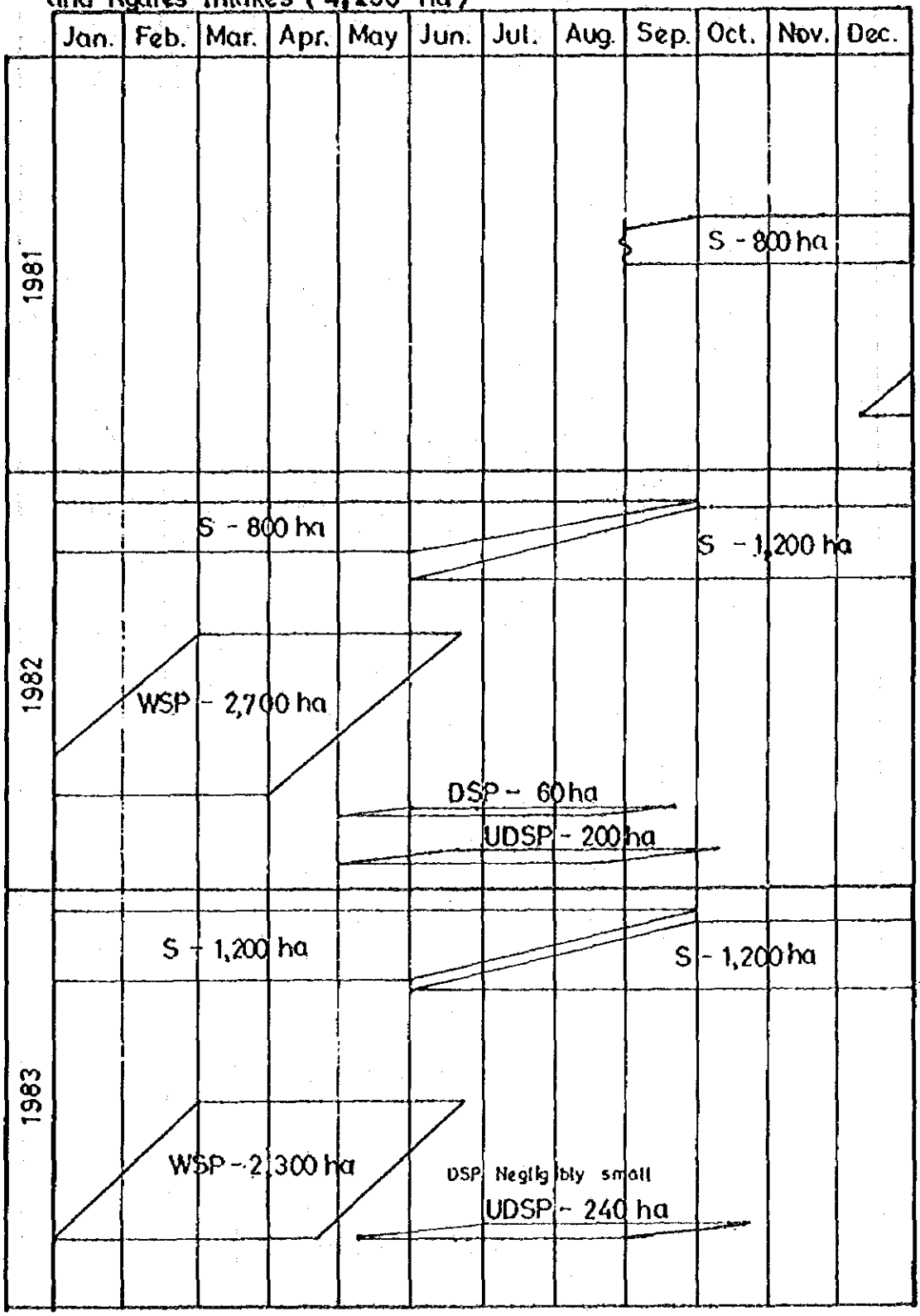


LEGEND : WSP = Wet season paddy
DSP = Authorized dry season paddy
UDSP = Unlicenced dry season paddy
S = Sugarcane

NOTE : Cropping pattern of polowijo is not illustrated due to no reliable data to estimated the growing stages

Fig. 3(5) CROPPING PATTERN ESTIMATED FROM PLANTING DATA

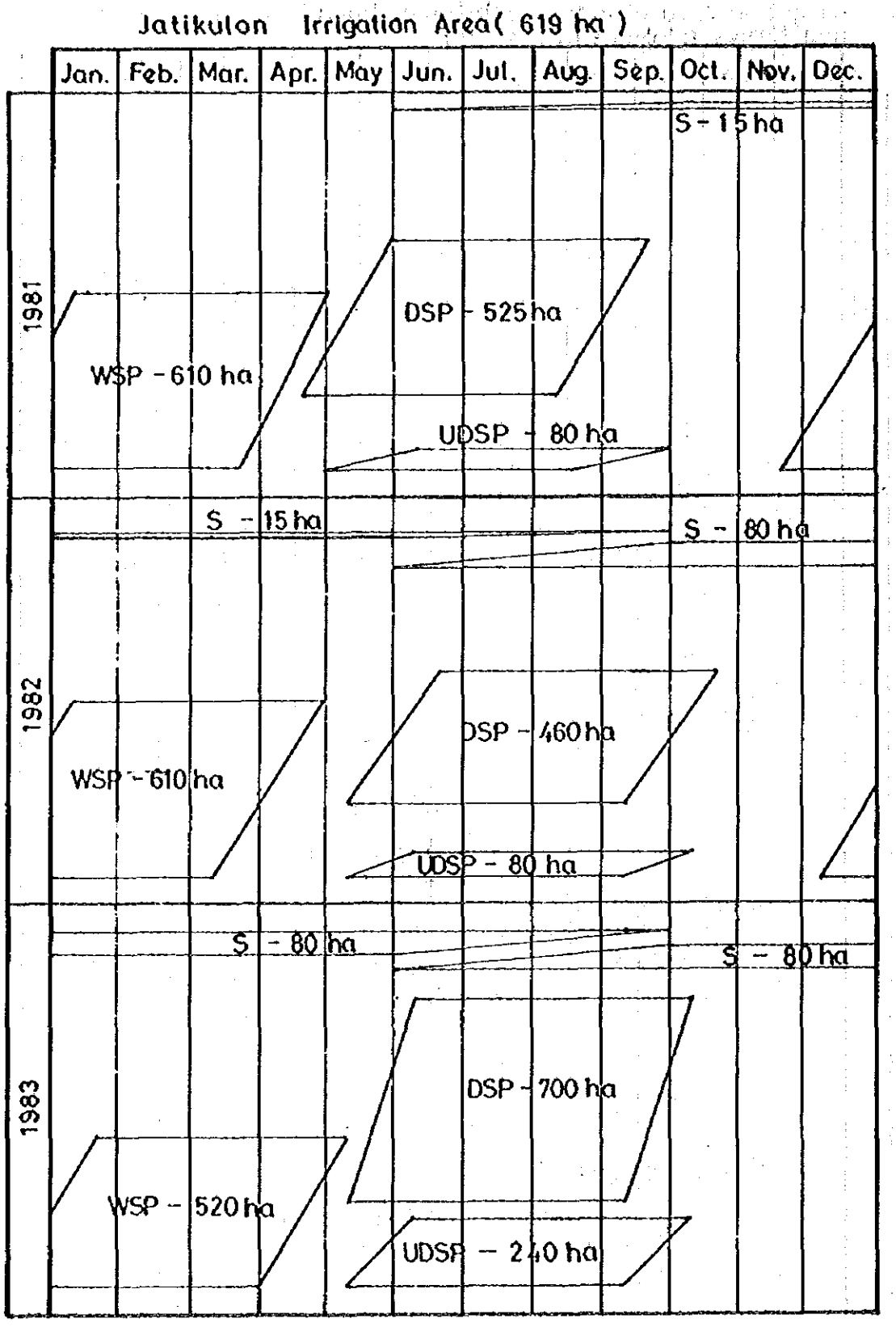
Irrigation Area of Gottan, Bebekan-Keboan, Wates Pinggir, Sidoringin and Ngares Intakes (4,238 ha)



LEGEND : WSP = Wet season paddy
DSP = Authorized dry season paddy
UDSP = Unlicenced dry season paddy
S = Sugarcane

NOTE : Cropping pattern of polowijo is not illustrated due to no reliable data to estimated the growing stages

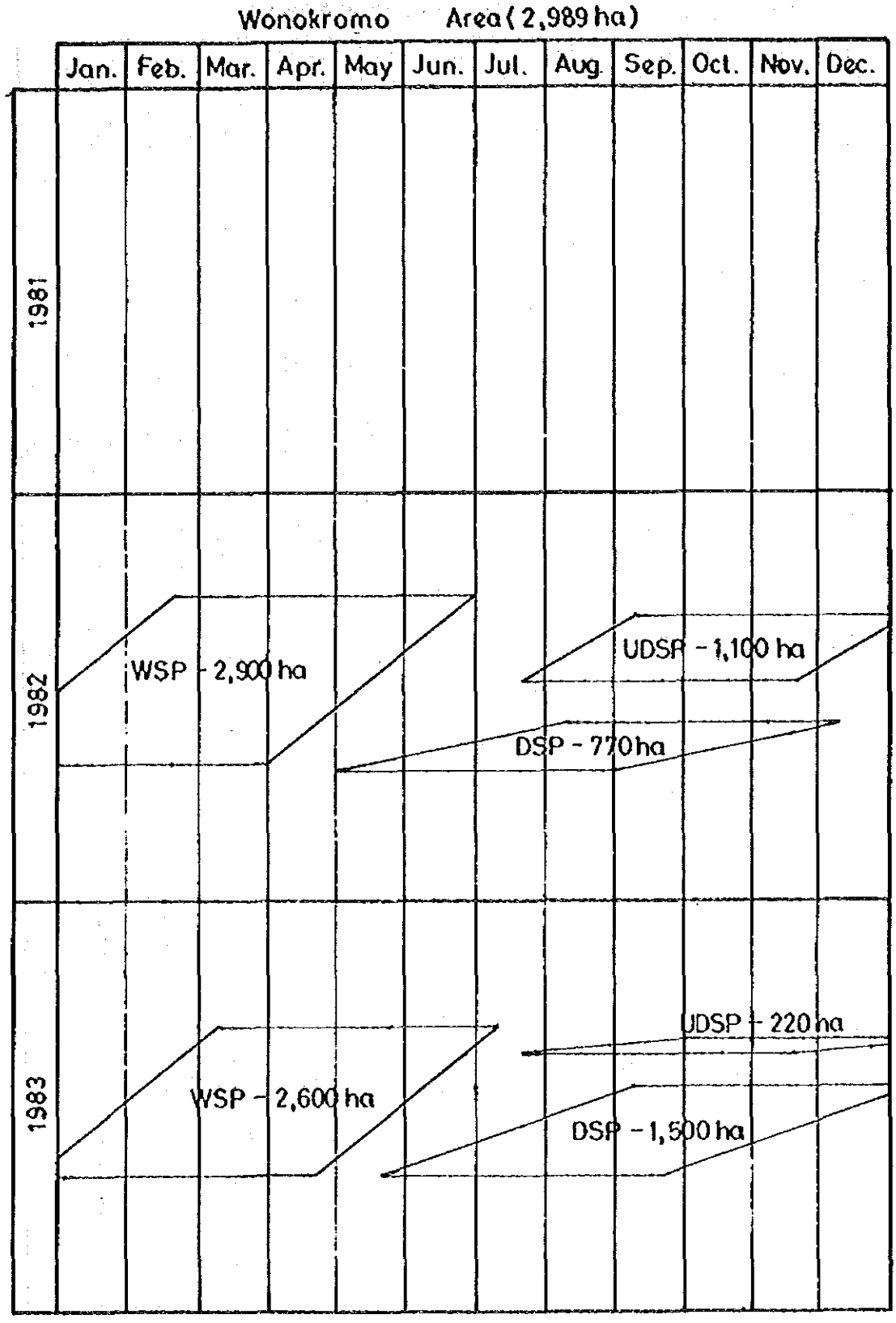
Fig. 3(6) CROPPING PATTERN ESTIMATED FROM PLANTING DATA



LEGEND : WSP = Wet season paddy
DSP = Authorized dry season paddy
UDSP = Unlicenced dry season paddy
S = Sugar cane

NOTE : Cropping pattern of polowijo is not illustrated due to no reliable data to estimated the growing stages

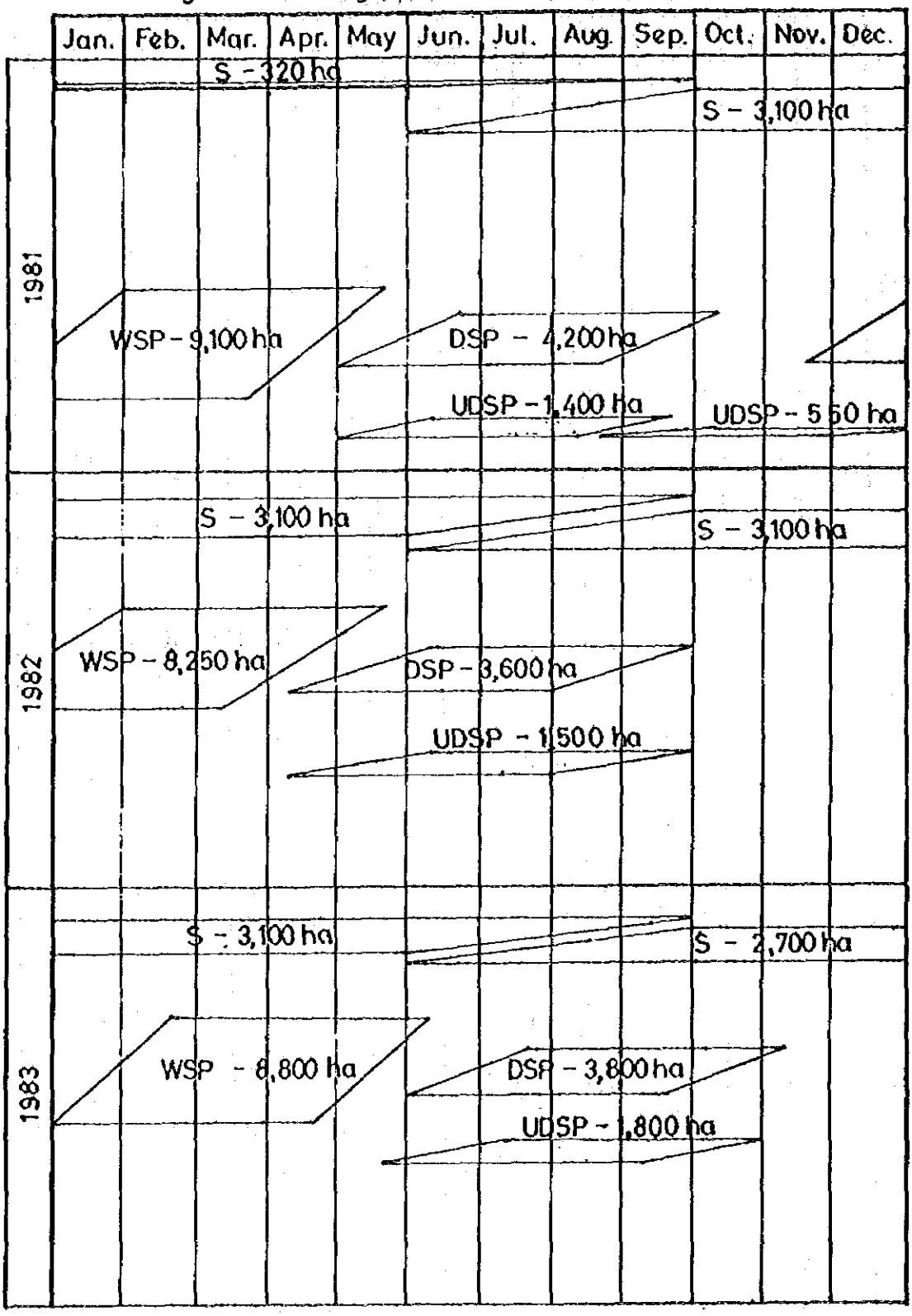
Fig. 3(7) CROPPING PATTERN ESTIMATED FROM PLANTING DATA



LEGEND : WSP = Wet season paddy
DSP = Authorized dry season paddy
UDSP = Unlicenced dry season paddy
S = Sugarcane

NOTE : Cropping pattern of polowijo is not illustrated due to no reliable data to estimated the growing stages

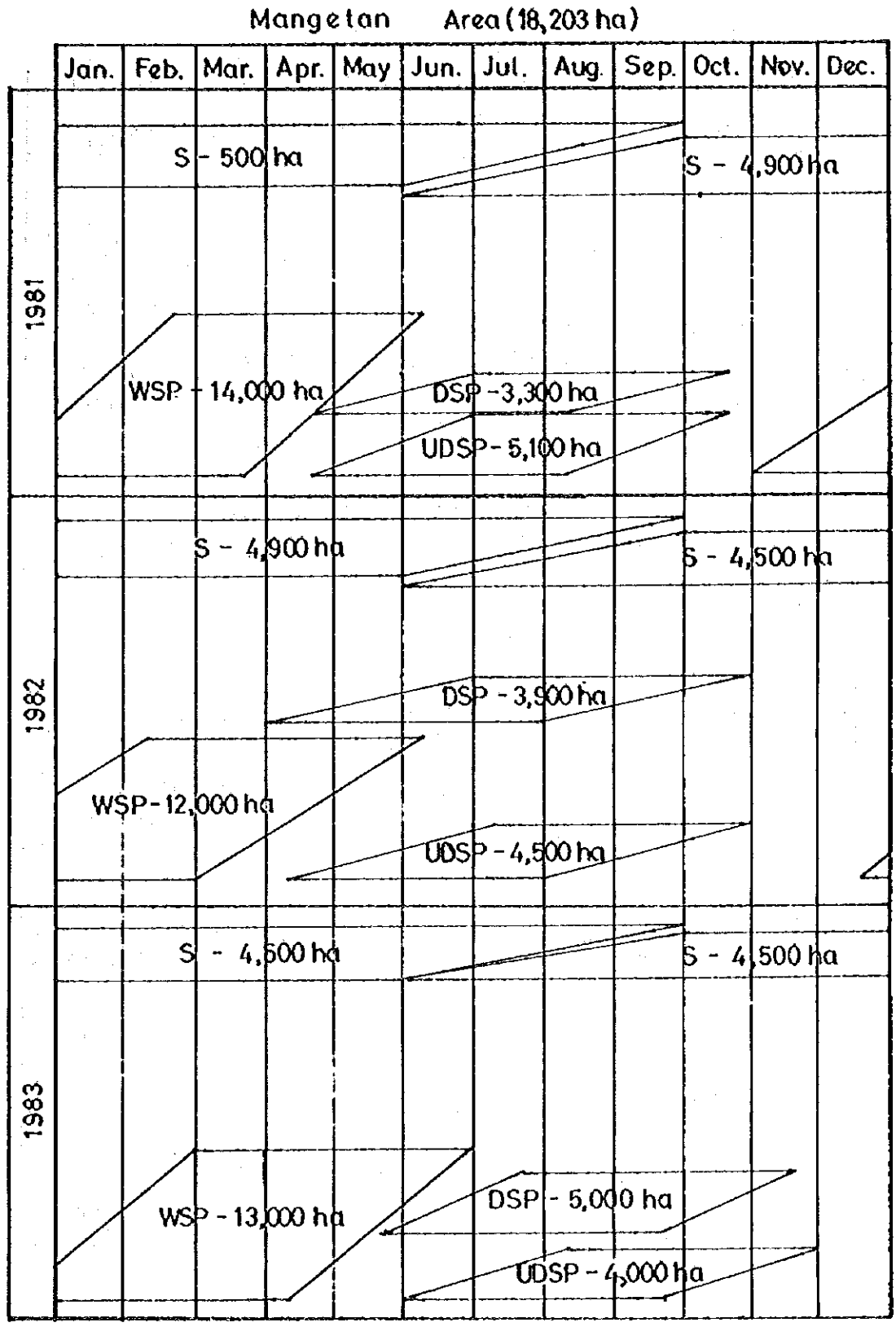
Fig. 3(8) CROPPING PATTERN ESTIMATED FROM PLANTING DATA



LEGEND : WSP = Wet season paddy
DSP = Authorized dry season paddy
UDSP = Unlicenced dry season paddy
S = Sugarcane

NOTE : Cropping pattern of polowijo is not illustrated due to no reliable data to estimated the growing stages

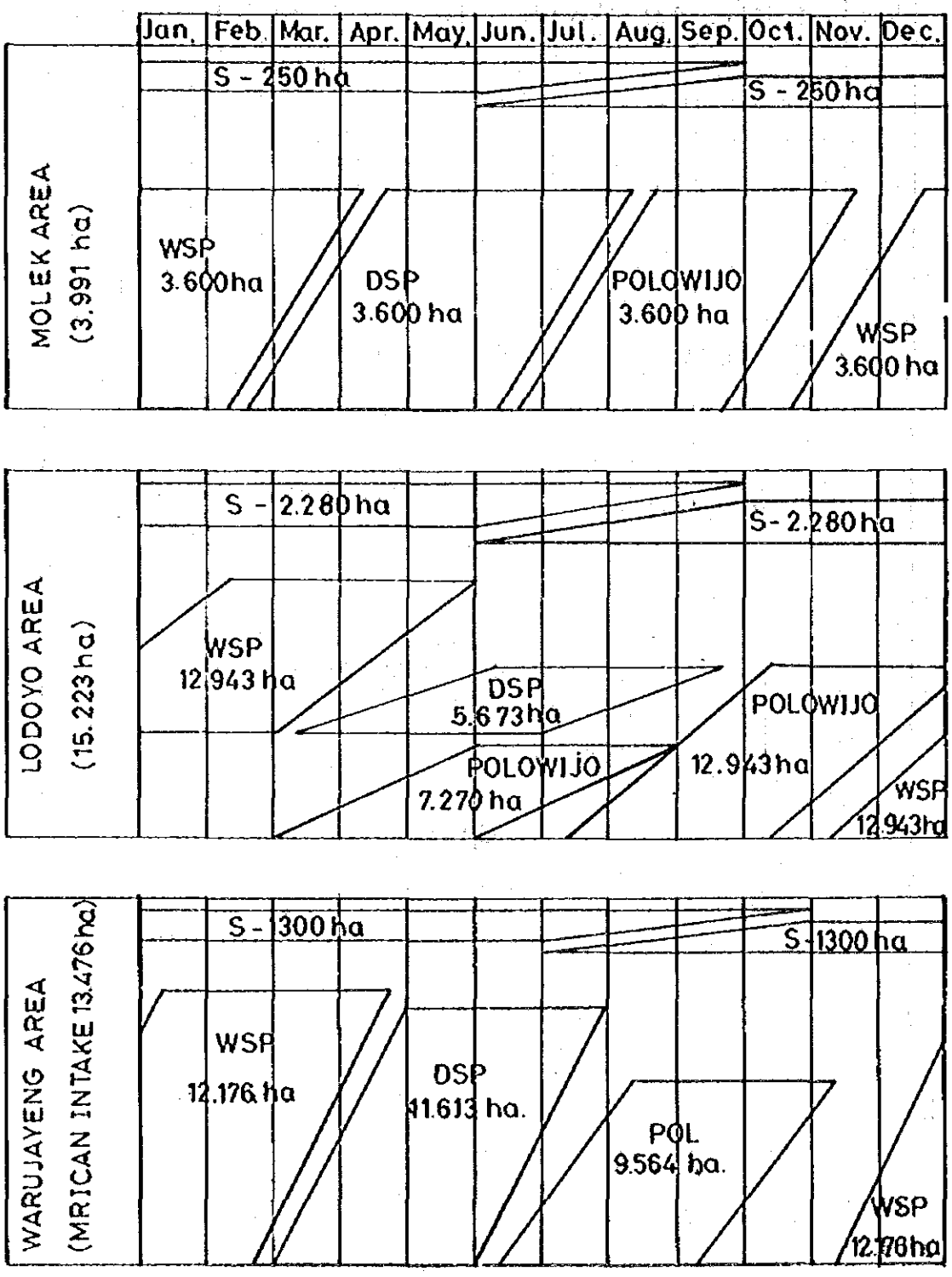
Fig. 3(9) CROPPING PATTERN ESTIMATED FROM PLANTING DATA



LEGEND : WSP = Wet season paddy
DSP = Authorized dry season paddy
UDSP = Unlicenced dry season paddy
S = Sugar cane

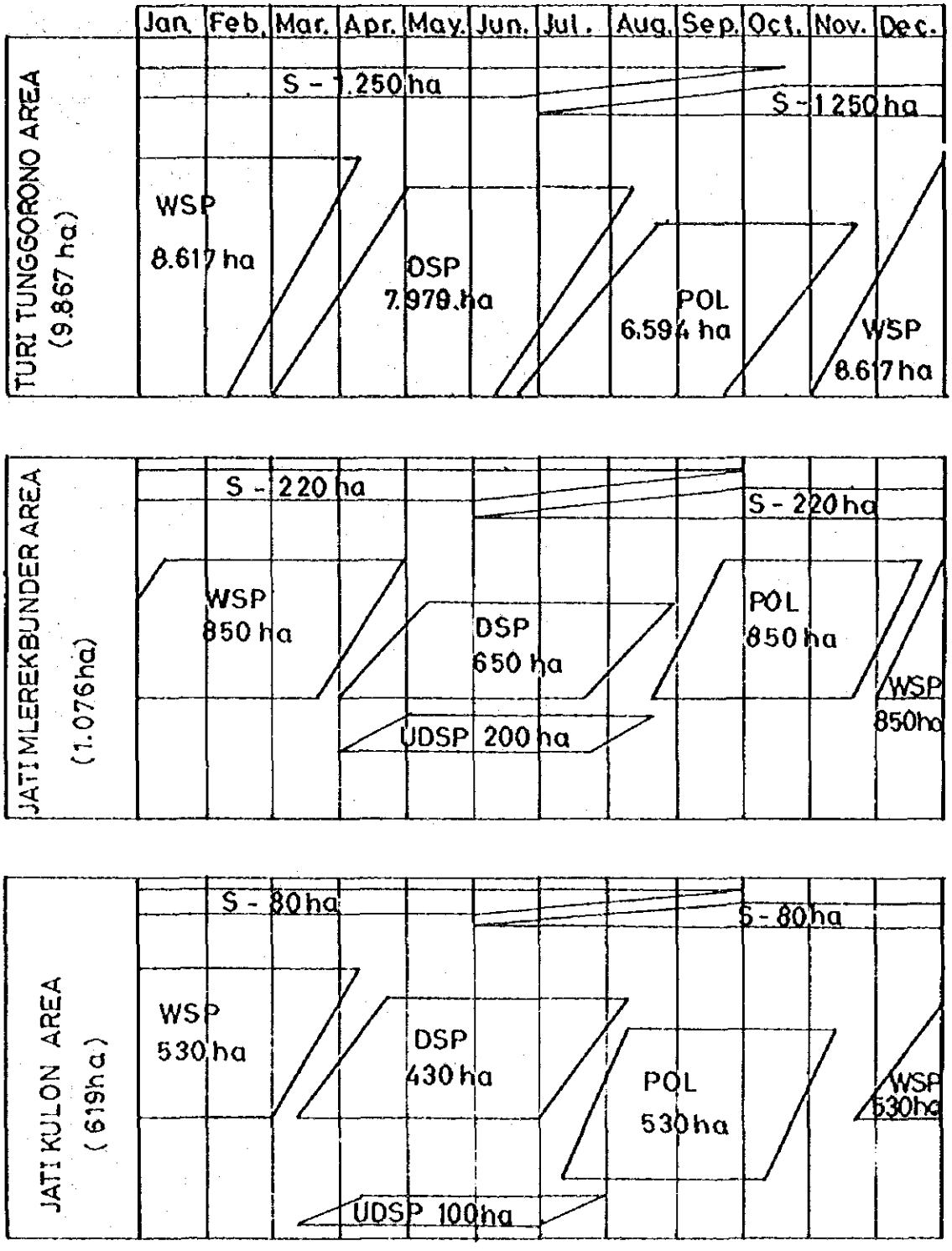
NOTE : Cropping pattern of polowijo is not illustrated due to no reliable data to estimated the growing stages

Fig. 3(10) CROPPING PATTERN ESTIMATED FROM PLANTING DATA



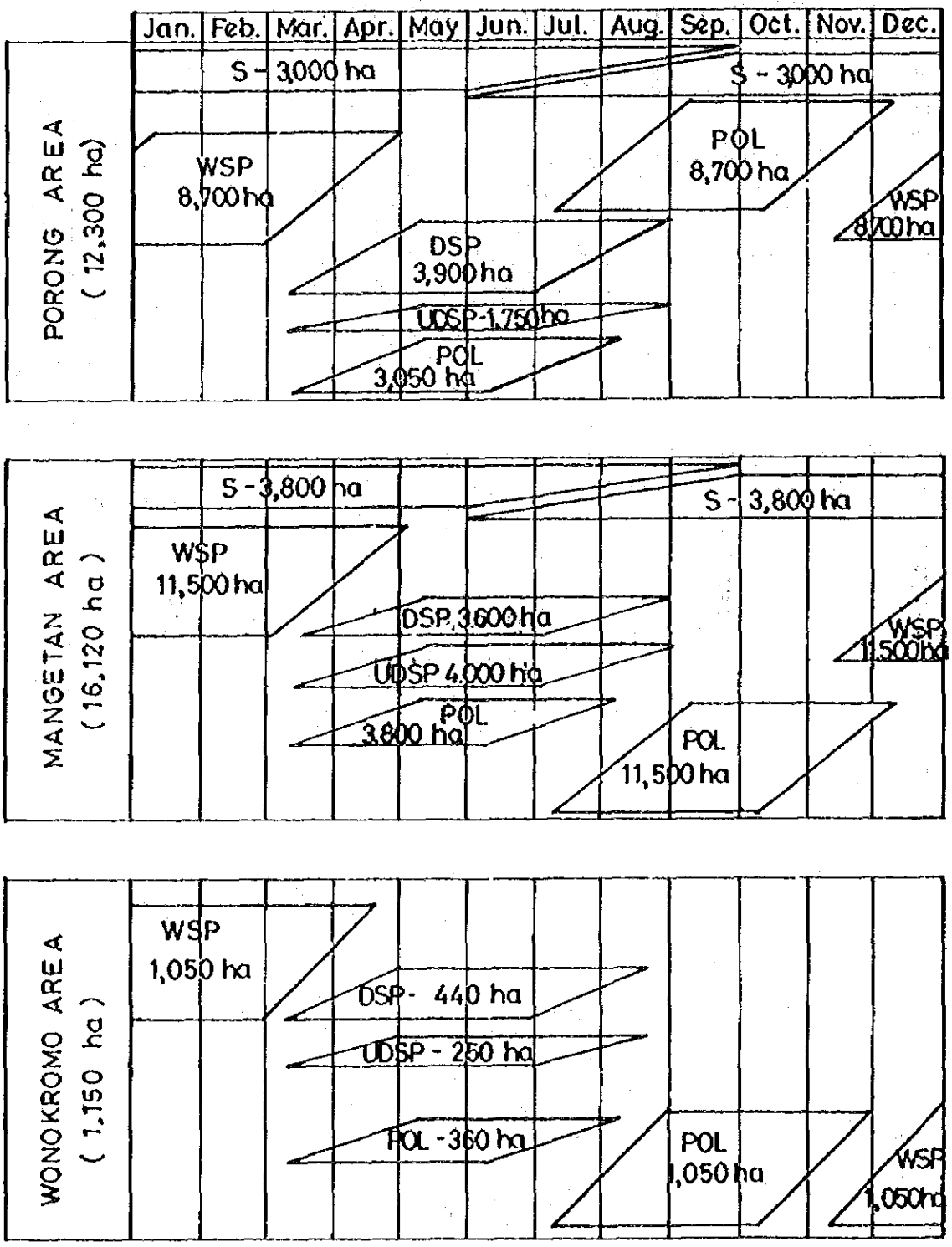
LEGEND : WSP = Wet season paddy.
DSP = Authorized dry season paddy.
UDSP = Unlicenced dry season paddy
S = Sugarcane
POL = POLOWIJO

Fig. 4(1) **FUTURE CROPPING PATTERN**
(FED FROM K.BRANTAS)



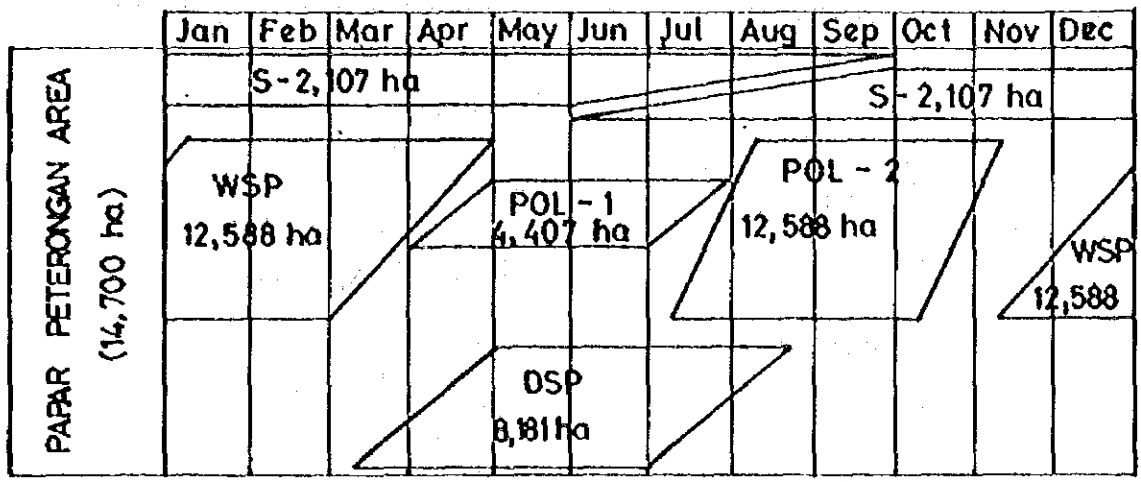
LEGEND : WSP = Wet season paddy
DSP = Authorized dry season paddy
UDSP = Unlicenced dry season paddy
S = Sugarcane
POL = POLOWIJO

Fig. 4(2) FUTURE CROPPING PATTERN
(FED FROM K. BRANTAS)



LEGEND: WSP = Wet season paddy
DSP = Authorized dry season paddy
UDSP = Unlicenced dry season paddy
S = Sugarcane
POL = Polowijo

Fig. 4(3) FUTURE CROPPING PATTERN
(FED FROM K. BRANTAS)



LEGEND : WSP = Wet season paddy
DSP = Authorized dry season paddy
UDSP= Unlicenced dry season paddy
S = Sugarcane
POL = Polowijo

NOTE : Irrigation water is not planned to be supplied to polowijo crop II acording to Pre-F/S report, April, 1984 prepared by SINOTECH.

Fig. 4(4) FUTURE CROPPING PATTERN
(FED FROM K. BRANTAS)

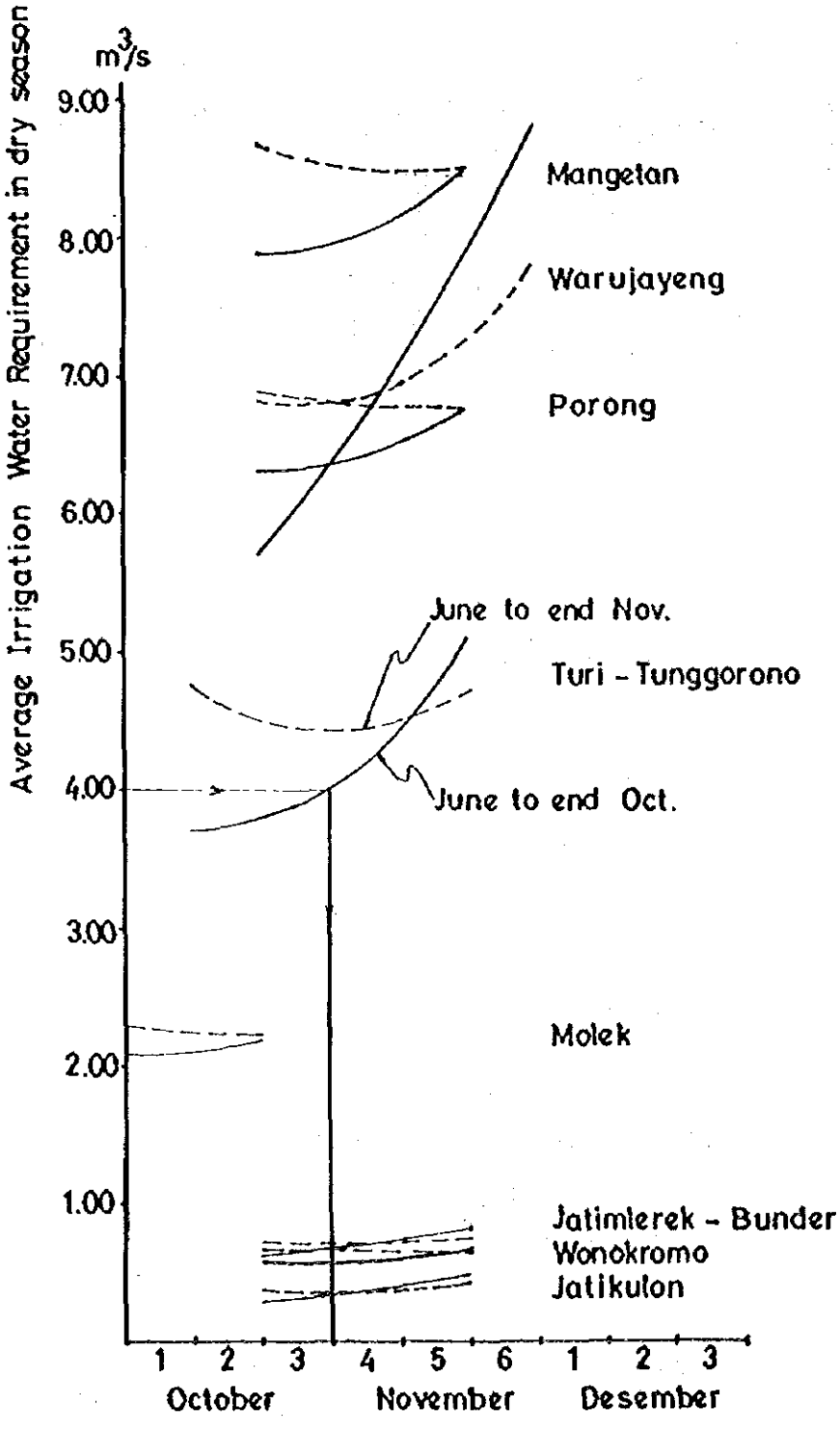


Fig. 5 OPTIMUM STARTING PERIOD OF WET SEASON PADDY FOR WATER SAVING.

NOTE A-18

REFERENCES AND SUMMARY OF ON-GOING
IRRIGATION PROJECTS

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REFFERENCES

Number		Name of Data	Author	Date of Issue
AI	01	Laporan Tahunan 1980, 1981, 1982, 1983	Dinas Pertanian Tanaman Pangan Daerah Propinsi Dati I, Ja-	1981 - 1984
AI	02	Luas Tanah Menurut Penggunaannya di Jawa Timur 1982	Kantor Statistik Prop. Jawa Timur	1983
AI	03	Pelepasan Varietas	Diterbitkan oleh Badan Benih Nasional 1983	1983
AI	04	Intensitas Tanaman (1982/83) and 1981/82 Jawa Timur	DPU Propinsi Dati I Jawa Timur Bidang Pengairan	1982/83
AI	05	Keadaan Irigasi	Wilayah PU Penagiran Jawa Timur	
AI	06	Office File of Sugar Production of Indonesian Sugar Research Institute 1980-1984	Indonesian Sugar Research Institute	1980-1983
AI	07	Laporan Tahunan 1982	Dinas Perikanan Daerah Propinsi Jawa Timur	1983
AI	08	Perikanan Jawa Timur Dalam Angka 1982	Dinas Perikanan Daerah Propinsi Jawa Timur	1983
AI	09	Atlas of 220 Weeds of Sugar-cane Fields in Jawa	C.A Backer	1973
AI	10	Pencandraan Dan Sifat Acronomis Varietas Tebu PS Bagian II (PS 21s/d PS 40)	Ir. Soedjono dan Drs. Soejoto Sastrowijono BP3G	1983
AI	11	Laporan Tahunan 1980 Annual Report (English Summary)	Indonesian Sugar Experiment Station	1980
AI	12	Laporan Tahunan 1981 Annual Report (English Summary)	Indonesian Sugar Experiment Station	1980
AI	13	Indonesia Government Agricultural and Rural Development Programmes and Related External Assistance (A Back - Ground Document)	Soegeng Amat, FAO - Consultant	1981

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AI 50	Exploitasi Pengairan	Soeherman, BIE DPU Prop, Daerah Tk. I Jawa Timur	1983
AI 51	Daftar Penetapan, baku Sawah Jawa Timur	DPU Prop. Daerah	1984
AI 52	Buku Pintar Daerah Irigasi PU Malang, Kasri, Kepanjen, Blitar, Tulungagung, Kediri , Nganjuk, Pare , Jombang, Mojoagung, Mojokerto, Sidoarjo, Wonokromo	Direktorat Irigasi Direktorat Jendral Pengairan DPU	1982
AI 53	Intake Discharge/Gauging height at Mrican Intake (Daily basis, 1962-1984)	Wilayah Jombang PU Pengairan Jawa Timur	
AI 54	Intake Discharge at Turi, Tunggorono, Bunder, Jatimlerek, Gottan, Bebekan,Kebo-an(ten day basis, 1969-1984)	Wilayah Jombang PU Pengairan Jawa Timur	
AI 55	Intake Discharge at Gottan, Bebekan, Watespinggir, Ngares, Losari, Lengkong, Porong, Mangetan dan Kemlanten and Wonokromo area	Wilayah Mojokerto PU Pengairan Jawa Timur	
AI 56	Intake Discharge at Lodoyo	Brantas Office	
AI 57	Penjelasan Singkat Tentang Kebutuhan Minimum Air Pengairan di Daerah Pengairan Waduk Karangkates 1981/82		
AI 58	Effisiensi Pemanfaatan Air Irigasi	Soeherman, BIE	1984
AI 59	Petunjuk "Tata-Tanam"	DPU Prop. Dati I Jawa Timur Bidang Pengairan	1984
AI 60	Operation & Maintenance Study	Sir. M.Macdonald & Partners Const.Engineers	1977
AI 61	East Java Irrigation Operation and Maintenance Vol. I Main Report	Sir. M. Macdonald & Partners	1981
AI 62	Office File of PU Pengairan Jawa Timur, Change of Paddy field	PU Pengairan Jawa Timur	1983
AI 63	East Java Irrigation System Planning Note	Sir. M.Macdonald & Partners	1983

Number	Name of Data	Author	Date of Issue
Ai 64	East Java Irrigation Rehabilitation Study Vol.1 Main Report	East Java Irrigation Service	1981
AI 65	East Java Irrigation Rehabilitation Study Vol. 2 Appendix	East Java Irrigation Service	1981
AI 66	East Java Irrigation Project Note on Priority Ranking for Wilayah Malang	Sir. M. Macdonald & Partners	1982
AI 67	East Java Irrigation Project Note on Priority Ranking for Wilayah Kediri	Sir. Mr. Macdonald & Partners	1982
AI 68	East Java Irrigation Project Note on Priority Ranking for Wilayah Mojokerto	Sir. M.macdonald & partners	1983
AI 69	East Java Irrigation Project Note on Priority Ranking for Wilayah Jombang	Sir. M.Macdonald & Partners	1984
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AI 73	Waru-Turi Barrage Study (Main volume and a supplementary report to the Warujayeng Turi Tunggorono Irrigation Project, F/S of Aug. 1981)	PT. Indah Karya / BINNIE and PARTNERS	1982
AI 74	Warujayeng - Turi Tunggorono Irrigation Project F/S Volume 1, Main Report	BINNIE And PARTNERS	1981
AI 75	Warujayeng - Turi Tunggorono Irrigation Project F/S Volume 4, Annex C: Sediment Studies, Annex D: Headworks, Annex E : Irrigation and Drainage System.	BINNIE And PARTNERS	1981

Number	Name of Data	Author	Date of Issue
AI 76	Warujayeng - Turi Tunggorono Irrigation Project F/S Volume 5 : Annex F : Land Evaluation, Annex G : Agriculture, Annex H; Economics	BINNIE & PARTNERS	1981
AI 77	Warujayeng - Turi Tunggorono Irrigation Project F/S Volume 6 Annex I : Socio-economics and Irrigation Annex J : Project Benefit A Monitoring and Evaluation	BINNIE & PARTNERS	1981
AI 78	East Java Groundwater Development Project Report on Cropping Pattern and 1982/1983 Crop Development (Agronote - 1)	Lin-Shin Chen (Agriculturist) Water Management Expert	1983
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AI 80	East Java Ground Water Development Project, Operation Manual For Tubewell Irrigation (Agronote - 3)	Lin-Shin Chen (Agriculturist/ Water Management Expert)	1984
AI 81	East Java Ground Water Development Project, Report on Water Resources Study and Irrigation Development Plan (Agronote - VII)	KOJI OKADA Water Resources Expert	1984
AI 82	East Java Ground Water Development Project, Study Report on Tenatively Proposed Development Area (Agronote - LX, ANNEX-IR-A-E) (A,B & D, E, 1/4 - 4/4 Main Report)	S BAN Irrigation Engineer	1984
AI 83	F/S Report on Tugu dam and Irrigation Project	NIPPON KOEI / PT INDRA KARYA	1984
AI 84	Warujayeng-Turi Tunggorono Irrigation Project, Preliminary Report of F/S on Papar Peterongan Sub-project	SINOTECH ENG. CONSULTANT, INC.	1984

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AI 85	Supporting Report for Detailed Design Work or Wonorejo dam and Irrigation Project Tulungagung II	NIPPON KOEI and P.T. Indra Karya	1984
AI 86	Feasibility Report on the Lesti III Dam and Irrigation Project	Brantas	
AI 87	Appraisal of the Irrigation Package Project and Tulungagung II and Baro Raya Irrigation Study in Indonesia	Asian Development Bank	1982
AI 88	Supporting Report for Detailed Design Work of Wonorejo dam and Irrigation Project Tulungagung II, Water Use Study in Brantas Basin	NIPPON KOEI	1984
AI 89	Wonorejo Dam and Irrigation Project under Tulungagung II, Water Demand and Supply Situation in Lower Brantas Basin	NIPPON KOEI	1983
AI 90	Wonorejo Dam and Irrigation Project under Tulungagung II, Revised Project Evaluation	NIPPON KOEI	Nov. 1984
AI 91	"Monthly Report on Consulting Services for Wonorejo Dam and Irrigation Project Under Tulungagung	NIPPON KOEI	1984
AI 92	"Supporting Report for Detailed Design Work of Wonorejo Dam and Irrigation Project Tulungagung II"	NIPPON KOEI	1984
AI 93	Lodoyo Irrigation Project Phase II Operation and Maintenance Mannual	Sir. M.Macdonald	1982
AI 94	Feasibility Report on Widas Irrigation Project	BRBDEO	1976
AI 95	Design Report on Wonorejo Dam and Irrigation Project, Tulungagung II.	NIPPON KOEI	1984

NAME OF PROJECT : East Java Irrigation Rehabilitation Project

1. Background

1.1 Need or Project : Existing irrigation facilities are operated in various stages of deterioration and unable to furnish required deliveries which are caused by lack of O & M funding, staffing and equipment for many years. Thus, this Project was formulated.

1.2 Hystory of project : Dinas Pengairan, Jawa Timur has engaged P.T. Indah Karya assisted by Sir. M. MacDonald and Partners to carry out surveys, data collection and analyses related to the East Java Rehabilitation Project.. The World Bank appraised the Project for part financing in March 1982. Rehabilitation study was made in 1982 and 1983. As of September 1984, actual rehabilitation works are being executed following to the design in first priority area of each of Daerahs.

1.3 Present Status of Project : Planning and construction

2. Objectives of the Project :

To rehabilitate existing main and secondary canals including tertiary offtakes so as to restore the functions of the regional design condition and to rehabilitate and upgrade tertiary systems except Waru-Turi area, Lodoyo area and Sidoarjo area.

3. Project Features

3.1 Project area : About 180,000 ha in net Daerah Malang, Kediri, Jombang, Mojokerto and Madura.

3.2 Project : Phase I, rehabilitation of irrigation facilities in first priority area of 50,000 ha, Phase II & III 130,000 ha.

3.3 Construction cost :
(1980 contstant price)

Case I, Full development (Economic cost/ha)	Capital works	405.6×10^3	Rp/ha
	O & M	10.8×10^3	Rp/ha
	Agr.extension	3.5×10^3	Rp/ha
Case II, Main system only (Economic cost/ha)	Capital works	294.6×10^3	Rp/ha
	O & M	10.8×10^3	Rp/ha/annual
	Agri.extension	3.5×10^3	Rp/ha/annual

NAME OF PROJECT : Lodoyo Irrigation Project.

1. History : In 1969, the construction was commenced, but, the work was suspended on the way due to budgetary reason. In 1973, the feasibility study was made and newly the construction work was commenced in 1975 with the loan financed by ADB.

2. Present Status : 95 % was completed as of March 1984

3. Project Features :

Net irrigaion area	15,200 ha
Main canal length	31,7 km
Secondary canal length	129,1 km
Drainage canals	369,4 km
Road	160,8 km
Tertiary block	163 unit

4. Implementation Schedule : To be completed in December, 1985

3.4 Benefit (1980 constant price) after full development

Case 1 Full development	Incremental benefit	388.3 x 10^3Rp/ha/annual
Case 2 Main system only	"	303.7 x 10^3Rp/ha/annual
O.& M and minor repair	"	322.0 x 10^3Rp/ha/annual

3.5 Economic Evaluation

Case 1 Full development	IRR = 26 %
Case 2 Main system only	IRR = 23 %

3.6 Implementation Schedule

Normally designs completed in one year is implemented in next year in each.

Phase I, Design; 50,000 ha to be completed in Nov. 1986
Construction;,50,000 ha to be completed in Apr. 1988

4. Water balance

Water availability is judged from the planting intensity of rice in June.

5. References : AI-64, 65, 66, 67, 68, 69, 70, 71, 72.

NAME OF PROJECT : East Java Operation and Maintenance Project

1. Background

- Need of Project - Deterioration of irrigation system through lack of regular maintenance
  - Loss of effective procedure for data collection and water control
  - No room to create new irrigation schemes
- Hystory of Project - March 1978, the Project was formulated by DGWRD for Sir. M. MacDonald and Partners under the United Kingdom Technical Assistance Programme.
- Present Status of Project - Pilot trial and training are being executed.

2. Objective of the Project

- To introduce new O & M procedures establised by the East Java Design Team.
- To determine the applicability of various types of mechanical equipment.

3. Project Features

3.1 Proposed Water Distribution

Based on the forecast of water availability and cropping planned, the irrigation schedule is made before crop-planting.

The irrigation water delivery is controlled on the basis of polowijo relative factor.

(1) Wet season

According to the irrigation schedule established before the crop planting, the irrigation water is distributed continuously from head to terminal canals.

(2) Dry season

For dry season water planning, three crops are considered - rice, sugarcane and polowijo consisting of maize, soybean, tobbaco, etc. At first, the area for planting rice and polowijo is authorized. Then, a forecast of water demands is made for the authorized cropping. If can supply more than the water demands, the farmers can grow unlicenced paddy. During the growing period, the water distribution requirements are assessed for each 10-day period, and then the water distribution is adjusted in the following 10-day period if necessary.

Canals are rotated in tertiary or secondary system when supplies fall below a certain level.

(3) Various forms of data are made for recording, processing and transmitting of rainfall, discharge, flood, crop calender, yield, damage and crop authorization.

3.2 Maintenance

Maintenance requirement is categorized as follows

- Regular maintenance by Cabang Seksi,
- Minor periodic repairs by Cabang Seksi,
- Emergency repairs, carried by a combination of direct labour and desa assistance. Gates or structural repairs by Seksi.
- Major repairs by contractors, design and recommendations by Seksi.

3.3 Organization

All the duties of maintenance staff are specified in detail in each level of offices.

The main emphasis in the stuffing structure and their numbers is put on the Seksi and Cabang Seksi stuffing.

4. Refferences : AI-61

NAME OF PROJECT : Warujayeng - Turi Tunggorono Irrigation Project

1. Background

1.1 Need of Project : Sediment in canal system
Deterioration of canal systems
Inundation of low-laying areas by flooding from K. Widas and K. Kedungsoko.

1.2 Hystory of Project: In 1980, GOI requested assistance from European Economic Community for preparing feasibility studies. The feasibility study was made in 1981.

In 1981 - 82, from the comments by the ADB appraisal mission and the DPU, the F/S was supplemnted to build a gated barrage on the K. Brantas, which serve both Waru Turi areas and other areas on the right bank of the K. Brantas, which is called Papar-Peterongan area. All the studies were completed in early April 1982.

1.3 Present Status of Project: Detailed design is being carried out for Waru-Turi areas and the barrage, and feasibility study for Papar-peterongan Project.

2. Objectives of the Project : Aims to increase the rice production by mainly introducing double cropping in whole area.

3. Project Features

3.1 Project Area : Astride the K. Brantas Middle Reach
Warujayeng area, about 27,300 ha in gross.
Downstream area of Waru-area suffers from flooding.
Turi-Tunggorono area, about 14,800 ha in gross.

3.2 Project Component
Warujayeng Sub-Project : Total net area of 13,600 ha.
Dredging of 1×10^6 m^3 from river channels,
Improvement to 60 km of flood bunds.
Construction of two flood retention areas.
Construction of Waru-Turi barrage.
Rehabilitation of canals and structures.
Tertiary development
Improvement of internal drainage system.

Turi-Tunggorono Sub-Project : Total net area of 9,867 ha
Improvement of internal drainage system at secondary and tertiary level.
Construction of new headworks.
Rehabilitation of existing irrigation system.
Construction of 11 km long new road, etc.

Papar-Peterongan Sub-Project : Total net area of 14,600 ha.

3. Construction Cost (1981 price)

Warujayeng Sub-Project : Total capital cost Rp. 17,425 x 10^6.
(1.24×10^6 Rp/ha)
Foreign exchange element ≒ 57%.
O & M cost Rp.420 x 10^6 (31×10^3 Rp/ha)

Turi-Tunggorono : Total capital cost, Rp. 7,506 x 10^6
(0.72×10^6 Rp/ha)
Foreign exchange element ≒ 56%.
O & M cost Rp.200 x 10^6. (20×10^3 Rp/ha)

3.4 Benefit (1981 base)

Warujayeng Sub-Project:	Present	Rp.10,650 x 10^6/year
	Future without project	Rp.11,360 x 10^6/year
	Future with project	Rp.21,170 x 10^6/year
	Incremental benefit	Rp. 9,810 x 10^6/year
Turi-Tunggorono Sub-Project :	Present	Rp. 8,860 x 10^6/year
	Future without project	Rp. 9,240 x 10^6/year
	Future with project	Rp.14,790 x 10^6/year
	Incremental benefit	Rp. 5,550 x 10^6/year

3.5 Economic Evaluation
Warujayeng project : IRR = 29 %
Turi-Tunggorono Sub-Project : IRR = 31 %

3.6 Implementation Schedule

Probability from 1986 to 1990

4. Water Balance

4.1 Water Requirement at head of main canals of both Waru-Turi

Unit : m^3/sec

		May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
I.	1-10	22.6	26.9	15.4	7.2	16.9	15.2	2.6	21.8
II.	11-20	25.0	26.9	7.5	10.8	18.7	11.3	6.2	26.5
III.	21-30	26.8	23.0	4.0	13.8	18.2	6.3	10.0	25.8

4.2 Water Avilability (5 year probability)

Unit : m3/sec.

		May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
I.	1-10	*	69	14	15	12	11	11	27
II.	11-20	*	35	14	14	11	10	11	58
III.	20-30	*	28	13	13	10	10	10	*

* greater than 70 m^3/sec.

4.3 Water Balance

Comparison between available flow and irrigation requirement indicates that it is not possible to fully irrigate. The Report, however, recommends that about 80% of non-sugar available land be planted to polowijo in consideration that the water shortage will not occur every year and that polowijo crops are relatively drought-resistant and will give acceptable yields even when under-irrigated.

5. Note :
   - According to the information of BRBDEO, water shortage between the demand and supply will be supplemented by releasing water from Wonorejo reservoir (allocated amount 33×10^6 m^3).
   - Papar-Peterongan sub-project is not mentioned in item 3 and 4.

6. Recommendation
   - Sedimentation balance to be changed by a proposed barrage is expected to be studied in detail.
   - Flood protection works against the flood from K. Widas should be studied in more detail.

7. References :

   AI-73 ~ AI-77.

NAME OF PROJECT : East Java Groundwater Development Project

1. Background : P2AT had developed about 150 wells serving about 6,000 ha for a last decade and is exploiting groundwater year by year. Most of the tubewells locate in Nganjuk - Kediri - Blitar zone. To develop the groundwater, the World Bank assisted the P2AT. The East Java Groundwater Development Project was formulated to make further development.

2. Objective of the Project : Aim at improvement of farmer's economy in the underdeveloped area through increasing the cropping intensity by supplying the groundwater exploited in the area where no surface water is expected.

3. Selection of area to be developed : In principal, selected from the surface water shortage area under the condition that the groundwater is expected to be available. The selection criteria are as follows.

   - Areas of on-going or expected projects planned to reach construction stage within REPELITA IV and V are deleted from the category of the proposed area.
   - Non arable lands are deleted.
   - Irrigation unit where sugarcane is cultivated over 15% of the commanding area, and the commanding area is under 180 ha or located within 5 km from a sugar factory is excluded.
   - Topographical slope over 15%, or top soil thickness less than 60 cm or light soil or frequent inundation areas are excluded.

4. Proposed Area : 30,000 ha for the Brantas basin composed of Mojokerto zone of 18,000 ha, Kediri - Nganjuk of 9,000 ha and Blitar of 3,000 ha.

   Out of 30,000 ha, the followings are to be incorporated into the first development phase (1982 - 1987)

   5,200 ha in Mojokerto zone
   4,900 ha in Kediri - Nganjuk zone

ANNEX MW

DOMESTIC AND INDUSTRIAL WATER SUPPLY STUDY

ANNEX MW

DOMESTIC AND INDUSTRIAL WATER SUPPLY

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DEMAND FORECAST FOR SMA

1. Surabaya Water, Waste Water, Drainage and Solid Wastes, 1976
   Vol. II Water Master Plan

PROJECTED AVERAGE DAY DEMANDS
EXPRESSED AS FLOW PER CAPITA SERVED WITH PIPED WATER

	Liters per capita per day				
Year	Domestic	Industrial and Commercial	Institutional	Losses	Total
1985	150	36	22	89	297
1990	150	29	17	73	269
1995	150	25	14	56	245
2000	150	22	12	46	230

EXISTING AND PROJECTED NUMBER OF SERVICE CONNECTIONS

	Cumulative Total Number of Connections						
	1975	1980	1982	1985	1990	1995	2000
Domestic	43,300	80,000	100,000	134,000	209,000	309,000	435,000
Industrial	4,200	4,500	5,000	7,000	9,000	11,000	14,000
Institutional	4,400	4,500	5,000	7,000	8,000	10,000	12,000
Commercial	5,100	5,000	7,000	8,000	9,000	11,000	14,000
TOTAL	57,000	94,000	117,000	156,000	235,000	341,000	475,000
Percent Residential	76	85	86	86	89	91	92

From the above, based on an assumed 225 effective working days per year, new connections must be installed at the following rates:

Period	No. of years	Approximate Numbers of New Connections		
		Total to be installed	Per Year	Per Day
1976 - 80	5	37,000	7,400	33
1981 - 82	2	23,000	11,500	51
1983 - 85	3	39,000	13,000	58
1986 - 90	5	79,000	16,000	71
1991 - 95	5	106,000	21,000	93
1996 - 00	5	134,000	27,000	120
TOTAL		418,000		

In 1975, 2,742 new connections were installed, for an average rate of 12 per working day.

2. Urban Development Planning Study, 1983

(1) Residential Water Supply

Service	Service Level (%)		Service Volume (ℓ/capita/day)	
Year	Piped	Vendor	Piped	Vendor
1980	10.9	23.4	219	20
1990	40	20	220	20
2000	70	10	220	20

(2) Industrial Water

Industrail water is estimated based on the consumption capita per day. In 1975 the consumption was high at around 300 ℓ/employee/day. This has decreased to 72 ℓ/employee/day in 1980. The future unit consumption is assumed to be 200 ℓ/employee/day in 1990 and 500 ℓ/employee/day in 2000. The port water demand is based on the future cargo handling volume.

Industrial Water

Year	2ry Sector Employment	Annual Growth Rate (%)	Unit Water Demand (ℓ/c/d)	Industrial Water Demand (m^3/d)
1980	162,959		72	11,733
(1985)	(224,000)			(44,801)
1990	308,029	6.57	200	61,606
2000	584,770	6.62	500	292,385

Port Water

Year	Sea Port Traffic /1 ($x10^3$ ton)	Annual Growth Rate (%)	Port Water (m3/d)	Unit Water Demand (ℓ/ton)
1980	5,762			
1985	(7,857)		(1,642)	
1990	10,714	6.40	2,241	0.209
2000	25,054	8.87	3,592	0.143

/1 1975 Constant price

(3) Social Water

Social water is estimated in relation with the population growth in SMA

Year	SMA Population	Annual Growth Rate (%)	Social Water (m^3/day)	Unit Water Demand (ℓ/c/d)
1980	2,905,414			
(1985)	(3,487,000)		(28,250)	
1990	4,186,574	3.72	33,919	8.10
2000	6,119,364	3.87	49,584	8.10

(4) Commercial Water

Commercial water is forecast based on the tertiary sector of GRDP.

Year	3rd Sector GRDP (10^6 Rp)	Annual Growth Rate (%)	Commercial Water (m^3/day)	Unit Water Demand ($\ell/10^6$ Rp/d)
1980	294,384			
(1985)	(404,848)		(27,854)	
1990	556,831	6.58	38,349	68.8
2000	1,047,463	6.55	72,122	68.8

(5) Design Factor

To estimate the water intake volume the peak factor, water losses in the distribution system, and losses at the purification plant and transmission system are assumed to be:

- Peak factor = $\frac{\text{Ave. Day Demand}}{\text{Max. Day Demand}} = 0.8$
- Water loss in distribution system:
  in 1990: 15%
  in 2000: 10%
- Losses in purification plant and transmission system: 8%

FUTURE WATER DEMAND IN SMA

Year	(1) Ave. Day Demand (m^3/day)	Max. Day Distribution Volume (2) Peak Factor	(1)×(2)=(3) Max. Day Demand	(4) Water Loss	(5)=(3)×(4) (m^3/day) Max. Day Distribution Volume	Max. Day Water Intake Volume (5) x 1.08 (m^3/day)	Total Demand Total (m^3/sec)	Net (m^3/sec)
1990	521,280	0.8	651,600	0.85	766,600	828,000	9.6	9.6 - 7.7* = 1.9
2000	1,372,304	0.8	1,715,380	0.9	1,906,000	2,059,000	23.8	23.8 - 7.7* = 16.1

* Available water calculated in Table 4.6.3.

BREAKDOWN BY SECTOR

Unit: m^3/day

Year	SMA Total Population	Service Level		Service Volume (ℓ/capita/day)		Domestic		Industrial		Social	Commercial	Total
		Piped Water	Vendor	Piped	Vendor	Piped Water	Vendor	Industrial	Port			
1980	2,905,414	10.9%	23.4%	219	20	-	-	-	-	-	-	-
1990	4,186,574	40	20	220	20	368,419	16,746	61,606	2,241	33,919	38,349	521,280
2000	6,119,364	70	10	220	20	942,382	12,239	292,385	3,592	49,584	72,122	1,372,304

3. Karangpilang Treatment Works Project

	Year		
	1985	1990	2000
Total population (millions)	2.38	2.86	3.82
Percentage population served:			
- by house connections	27%	36%	57%
- by public tap	49%	41%	30%
Population served (millions)			
- by house connections	0.64	1.03	2.20
- by public tap	1.16	1.16	1.16
Per capita demands (lpcd)			
- by house connections	200	200	200
- by public tap	20	20	20
Total domestic demand (m^3/d)			
- for house connections	128 240	206 160	439 500
- for public tap	23 200	23 200	23 200
- total	151 440	229 360	462 700
Total non-domestic demand (m^3/d)	65 000	74 750	150 825
Losses (as percentage of supply)	25%	25%	25%
Total average day demand (m^3/d)	288 600	405 500	818 000
Total average day demand* (m^3/s)	3.51	4.86	9.64
Seasonal peaking factor	25%	25%	25%
Total peak day demand (m^3/s)	4.38	6.07	12.05

Notes:

* This total includes allowance of 15,000 m^3/d for Gresik supply as detailed in CDM report.

PROJECTED DEMANDS

Year	Surabaya: Total Population	Surabaya: Percent Population Served, Piped Water	Surabaya: Percent Population Served, Via Vendors	Surabaya: Demand, m³/day, Avg. Day	Surabaya: Demand, m³/day, Max. Day	*Gresik: Demand, m³/day, Avg. Day	*Gresik: Demand, m³/day, Max. Day	Total System Max. Day Design Demand m³/sec, Total	Total System Max. Day Design Demand m³/sec, **Net
1975	2,010,000	17	27	144,000	-	-	-	1.6	0***
1985	3,120,000	30	25	278,000	348,000	8,000	9,000	4.1	1.9
1990	3,660,000	40	23	393,000	491,000	11,000	14,000	5.8	3.6
1995	4,310,000	50	21	528,000	660,000	13,000	16,000	7.8	5.6
2000	5,060,000	60	20	699,000	874,000	15,000	19,000	10.3	8.1

* From Reference [1]

** Assuming existing Ngagel treatment plants and Pandaan springs remain in service and produce 2.2 m³/sec.

*** 1975 demand is suppressed by limitations in production capacity.

Year	Population Served, Piped Water	Population Served, Via Vendors	Projected Average Day Demand (Exclusive of Gresik) Components, m³/day: Domestic, Piped Water	Domestic, Vendor Sales	Industrial, General	Industrial, Port	Institutional	Commercial	Losses	Total
1985	940,000	780,000	124,800	15,600	26,750	1,630	20,530	5,260	83,400	278,000
1990	1,460,000	840,000	202,800	16,800	33,800	2,080	24,980	6,390	106,100	393,000
1995	2,160,000	905,000	305,150	18,100	42,710	2,650	30,390	7,780	121,200	528,000
2000	3,040,000	1,000,000	435,400	20,000	53,950	3,390	36,980	9,460	139,800	699,000

NOTE MW-2 REFERENCES

Number	Name of Data	Auther	Date of Issue
MW 01	Rural Water Supply - East Java Province Indonesia, Premilinary Engineering & Feasibility Report. Summary Report Vol.1 : KRISIK SYSTEM - BLITAR REGENCY (WHO/UNDP PROJECT)	P.T. ENCONA Engineering INC. Jakarta Indonesia	1980
MW 02	- Ditto - Vol. 1: KAPYURAN SYSTEM, TUBAN REGENCY	P.T. DACREA Jakarta, Indonesia	1981
MW 03	- Ditto - Vol. 1 : KAPYURAN SYSTEM, PACITAN REGENCY	- Ditto -	1980
MW 04	- Ditto - Vol. 1 : GANGGING SYSTEM, MAGETAN REGENCY	- Ditto -	1981
MW 05	East Java IBRD Water Supply Project Part A ain Report	Sir M.MacDonald & Partners Asia Surabaya, Indonesia	Aug. 1982
MW 06	Urban Development Planning Study on Gerbangkertosusila Region (Surabaya Metropolitan Area) Final Report	JICA	March 1983
MW 07	Data Sheets (1) East Java Water Supply Project Location Map (2) List of IKK Towns (3) Population, Population Served Physical Target IKK Town Subproject	Direktorate Jendral CIPTA KARYA, Departement Pekerjaan Umum, Surabaya	Sept. 1984
MW 08	Data Sheets (1) Kebutuhan Air Bersih Warga Kota Malang, TAHUN: 2,000 (2) Data Sumber-Sumber Air Minum Kodya Malang dan Tandon-Tandon Air	PDAM of Malang	Sept, 1984

Number	Name of Data	Auther	Date of Issue
MW 09	Data Sheets (1) List of Water Supplies from Kali Brantas (Licenced/ Licences being processed); The East Java Provincial Public Works Irrigation Service for Drinking Water, Industrial and Agricultural (2) List of Companies/Industries, using Facilities of water supplies from Kali Brantas; The east Java Provincial Public Works Irrigation Service for Drinking Water, Industrial a and Agricultural	East Java Provincial Public Works Irrigation Service	Sept. 1984
MW 10	Data Sheets : DATA PERUSANAAN DAERAH AIR MINUM	P.D.A.M. of Mojokerto	Sept, 1984
MW 11	East Java IBRD Water Supply Project Part B Preliminary Design Studies Volume 5, Tulungagung	Consortium Consultant ARCK	Aug. 1982
MW 12	East Java IBRD Water Supply Project Part B Preliminary Design Studies Volume 9, Ngunut, Lawang Singosari	Consortium Consultant ARCK	Oct. 1982
MW 13	Second East Java IBRD Water Supply Project Preliminary Study Reports Kabupaten Blitar	CIRIAJASA Consulting Engineers	March 1984
MW 14	Second East Java IBRD Water Supply Project Preliminary Study Reports Kabupaten Kediri	CIRIAJASA Consulting Engineers	March 1984
MW 15	Second East Java IBRD Water Supply Project Preliminary Study Reports Kabupaten Nganjuk	CIRIAJASA Consulting Engineers	March 1984
MW 16	East Java IBRD Water Supply Project Part B Preliminary Design Studies Volume II, Sidoarjo	The Consortium Consultant III	Oct. 1982

Number	Name of Data	Auther	Date of Issue
MW 17	The Consulting Service Project for Water Supply for 100 Ibukota Kecamatan in East Java. Preliminary Report Kabupaten Mojokerto. Code : 3516	CIRIAJASA & Associate Consortium Consultant	-
MW 18	Buku Kesatu Preliminary Engineering Design Air Minum Kota Mojokerto. Final Report	P.T. INDAH KARYA	1979
MW 20	Kumpulan Data dan renca garis Besar Sistim Penyediaan Air Minum Kota Kepanjen	Direktorat Jenderal CIPTA KARYA Dept.PU Proyek Air Bersih & Penyehatan Lingkungan Jawa Timur	-
MW 21	Kumpulan Data Dan Rencana Garis Besar Sistin Penyediaan Air Minum Kota Kertosono		-
MW 22	Master Plan and Feasibility for Kediri and Blitar Water Supply Volume 5 CITY OF BLITAR REPORT	Local Subcontractor P.T.BUDESCO	1979
MW 23	Statistik Industri Jawa Timur 1981	Kantor Statistik Prop. Jawa Timur	1981
MW 24	Statistik Industri Jawa Timur 1982	- Ditto -	1982
MW 25	Statistik Industri Jawa Timur 1980	- Ditto -	1980
MW 26	Registrasi Aneka Industri 1980 Propinsi Jawa Timur	Kantor Statistik Prop. Jawa Timur Dan Direktorat Jenderal ANEKA INDUSTRI	1980
MW 27	Karangpilang Treatment Works Project Feasibility Study - Final Report Volume 1 : Main Report	Sir.M. MacDonald & Partners Asia	Feb. 1984
MW 29	Master Plan Surabaya 2000 Volume I & II	Perusahaan Daerah Air Minum Tk. II Surabaya	May 1977
MW 30	Study for Surabaya Water, Wastewater, Drainage and Solid-wastes Volume II; Water Supply Master Plan and Feasibility Study for First Stage Improvment	Camp Dresser & McKee INT. INC	Sept. 1976
MW 31	Umbulan Spring Bulk Water Supply Project East Java Province Detailed Work Program Report	Pasific Consultangs in Association with Sinitech Engineering Consultant	Jan. 1984

Number	Name of Data	Auther	Date of Issue
MW 32	Second East Java IBRD Water Supply Project Design Review Report (Category 3 and 4 Towns)	Sir. M. McDonald & Partners Asia	March 1984
MW 33	Reception/Work Program Information 1984 - 1985 by PAB	PAB	
MW 34	Surabaya Industrial Estate Rungkut (1) Industrial land and buildings (2) Facts & Information (FI - 9IV-84)	P.T. SIER (PERSERO)	Jan. 1984
MW 35	Drinking Water Quality's standard (Guidline of Ministry of Health No. 01/Birhukmas/1/1975 date, April 26, 1975)	PDAM DKI JAYA	1977
MW 36	Guidline of Quality Standard of Industrial Wastewater in East Java	Governor of East Java	1978
MW 37	Guidline of Ministry of Health No. 173/Men Kes/Per/VIII/77	"PERPAMSI" Periodical Magazine	1977
MW 38	Laporan Pelanggaran, Pemakaian Air 1974 s/d 1983	PDAM Surabaya	Sept. 28th, 1984
MW 39	Peta Proyek Air Bersih Jawa Timur	PAB	
MW 40	Brantas River Condition September '83 - August '84	P.T. AJINO-MOTO Mojokerto Factory	Sept. 13, 1984
MW 41	Second East Java IBRD Water Supply Project Preliminary Study Reports Kabupaten Trenggalek	CIRIAJASA Consulting Engineers	March 1984

TABLE MW-1 SOURCES OF DRINKING WATER IN URBAN

Unit : household

	Pipe	Pump	Well	Spring	River	Rain	Oth-ers	Not stated	Total
Kabupaten									
Trenggalek	51	86	5,576	-	34	-	-	-	5,747
Talungagung	21	336	25,876	21	21	-	1,322	-	27,597
Blitar	21	88	14,368	129	-	-	22	-	14,628
Kediri	21	974	11,730	2,656	-	-	20	-	15,401
Malang	6,235	706	23,393	6,121	1,575	-	-	23	38,053
Mojokerto	316	329	8,894	18	-	-	38	72	9,667
Jombang	237	1,228	18,990	64	-	-	-	-	20,519
Nganjuk	42	1,575	15,659	-	-	-	-	-	17,276
Sidoarjo	9,601	1,415	22,608	72	19	-	112	112	33,939
Sub total	16,545	6,737	147,094	9,081	1,649		1,514	207	182,827
%	9.0	3.7	80.5	5.0	0.9		0.8	0.1	
Kotamadya									
Kediri	733	3,260	28,772	79	-	-	-	587	33,431
Blitar	63	2,192	12,805	-	-	-	-	-	15,060
Malang	17,123	4,740	64,189	2,784	19	-	291	999	90,145
Mojokerto	536	3,114	9,779	-	-	-	-	-	13,429
Surabaya	316,141	7,208	33,370	303	123	40	1,985	266	359,436
Sub total	334,596	20,514	148,915	3,166	142	40	2,276	1,852	511,501
%	65.4	4.0	29.1	0.6	0	0	0.4	0.4	
Total	351,141	27,251	296,009	12,247	1,791	40	3,790	2,059	694,328
%	50.5	3.9	42.6	1.8	0.3	0	0.5	0.3	

TABLE MW- 2 SOURCE OF DRINKING WATER IN RURAL

Unit : Household

	Pipe	Pump	Well	Spring	River	Rain	Others	Not stated	Total
Kabupaten									
Trenggalek	201	341	68,711	42,471	2,153	-	1,230	20	115,127
Tulungagung	603	367	118,470	20,201	9,068	20	1,648	20	150,397
Blitar	3,487	691	151,120	51,484	1,511	-	210	57	208,560
Kediri	809	1,826	220,098	17,141	5,211	-	445	175	245,705
Malnag	21,588	2,415	174,127	151,112	47,018	39	3,573	195	400,067
Mojokerto	4,756	3,648	121,136	9,692	6,335	-	411	59	146,037
Jombang	2,102	1,053	167,924	6,201	1,580	-	79	39	178,978
Nganjuk	1,311	1,885	151,120	11,828	5,528	-	605	61	172,338
Sidoarjo	762	929	131,613	185	2,041	829	163	268	136,790
Sub total	35,619	13,155	1,304,319	310,315	40,445	888	8,364	894	1,753,999
%	2.0	0.8	74.4	17.7	4.6	0.1	0.5	0.1	
Kotamadya									
Kediri	-	133	9,064	57	-	-	38	-	9,292
Blitar	-	-	573	-	-	-	-	-	573
Malang	38	19	4,076	1,710	1,938	-	19	19	7,819
Mojokerto	-	-	-	-	-	-	-	-	-
Surabaya	25,375	2,376	27,694	25	-	1,350	1,225	-	58,045
Sub total	25,413	2,528	41,407	1,792	1,938	1,350	1,282	19	75,729
%	33.6	3.3	54.7	2.4	2.6	1.8	1.7	-	
Total	61,032	15,683	1,345,726	312,107	82,383	2,238	9,646	913	1,829,728
%	3.3	0.9	73.5	17.1	4.5	0.1	0.5	0.0	

TABLE MW- 3 (1) EXISTING FACILITIES OF WATER SUPPLY OF PDAM SURABAYA CITY (PANDAAN AND UMBULAN SPRING SYSTEM)

Name of Facilities	Pandaan Spring System	Umbulan Spring System
Water sources name	(1) Plintahan I and Toyoaring Spring (2) Plintahan II Spring (3) Pandaan Area Spring	Umbulan Spring
Yield Capacity (l/s)	(1) -60/(2) -15/(3) 30	115
Developed Year	(1) -1903/(2) - 1919/(3) - 1924	1932
Elevation (M - ASL)	About 103 m	25 m

- Total transmitted capacity = 320 L/S. The supply amount of Gempol, Sidoarjo, etc (as recorded in 1983, 3 months Average = 111 l/s). So this amount is reduced from 320 l/s
- Net amount available for supply to Surabaya = 209 (320 - 111) l/s

Spring Water Transmission Facilities

Reservoir of Source		
- Name	Tamanan Reservoir	Umbulan
- Capacity (m^3)	50 m^3	50 m^3
- Location	Pandaan Spring Area	Umbulan Spring outlet
- Elevation (M - ASL)	103 m	25 m
- Use	Juction and equalizing chamber joining the water collection pipes of Pandaan spring and chlorination	Pump section well and spring water collection
Pumping Station		
- Name	-	(1) Umbulan spring pumping station (2) Gempol pump station
- Number of Pumps		(1) - 2 / (2) - 2
- Pump unit capacity		(1) - 125 l/s / (2) 170 l/s x 70 m

TABLE MW- 3(2) EXISTING FACILITIES OF WATER SUPPLY

OF PDAM SURABAYA CITY
(NGAGEL WATER TREATMENT PLANT)

Name of Facilities	Plant No. I	Plant No. II	Plant No. III
	The raw water is from Surabaya River		
Rated Capacity	Q = 1 m^3/s	Q = 1 m^3/s	Q = 1 m^3/s
Grit Channels	Three parallel Grit channels carry the total flow of 3.5 m^3/s immediately upstream of Jagir dam		
Pre-sedimentation Basins			
Number of units/type	4/open channel	2/open channel	3/open channel
Each size (Meters)	50 x 40 x 2.5 SWD	95 x 55 x 1.5 SWD	95 x 55 x 1.5 SWD
Overflow rate	17.04 $m^3/day/m^2$ One unit stopped = 14.37	8.3 $m^3/day/m^2$ All Basin in operation	5.5 $m^3/day/m^2$ - " -
Detention time	6 hours per unit operated in series of two	10.9 hours all basins in operation	16.35 hours all basins in operation
(1) Coagulation Basins	Uncovered conventional type	Clarifiers with Sludge scrapers	Flash Mixer 6.4 x 3.2 x 4.72 m Retention time = 1.3 MIN
Number of units	4 in parallel	4	1 (Dosing facilities are for Alum, polymers and chlorine solution)
Each size (Meters)	25x10.5x4.2 SMD	19.0 DIA x 4.0SMD	
Overflow Rate	28.8 $m^3/day/m^2$ Assumed covered Basin out	76.2 $m^3/day/m^2$	
Detention time	3.25 hours Assumed covered Basin out	1.25 hours	

Name of Facilities	Plant I	Plant II	Plant III
(2) Coagulation	Tube selthler	Upflow Accelator	
Basins	High Rate Type	clarifier	
Number of Units	2 in series	4	
Each size (Meters)	20x18.5x4.6 SMD	19.0 DIAx5.0 SMD	
Overflow rate	16.7 $m^3/day/m^2$ *	76.2 $m^3/day/m^2$	
Detention time	1.4 hours	95 min	
- Filters		Degramon Type	Multi Media Type (Neptune)
Number of units	32 x 6 Blocks	22	6 x 2 Banks
Each size (Meters)	3.0x1.5x2.0 Total Depth	10.0 x 3.56	8.23 x 4.12 x 4.4
- Filteration Rate	100.8 $m^3/day/m^2$	109 $m^3/day/m^2$	259 $m^3/day/m^2$
Media (sand)	0.32 mm	1.06 mm	412.5 mm -ANTHRACITE
Effective size			225 mm -Sand
			112.5 mm -Density Sand
Media Uniformity Coefficiency	1.40	1.47	-
Filter Run (By schedule)	24 hours	24 hours	24 hours
Clear Water Reservoir			
Number of units	2	2	1
Each size (Meters)	9x19x5.0 SMD	-	-
Total Volume	1,650 m^3	350 m^3	2,070 m^3
Volume as % Daily capacity	1.91 %	0.41 %	2.40 %
- Pumps	For Filter Head Tank Type	For Raw Water w/Air	Back Wash
Number of units	Wash Rate = 0.1 m^3/s	6	2

Name of Facilities	Plant I	Plant II	Plant III
Each capacity	2 Filters=40 m/H	0.3 m^3/sx36 M 75 HP.350V,50HZ	0.23 m^3/s x Wash rate = 24.4 M/H - one pump
- High Lift Pumps	Distribution	Distribution	
Number of units	3	5	
Each rate capacity	0.22 m^3/sx25m	3-0.33m^3/sx30m 3-0.25m^3/sx40m	
Motors	100HP,440V,50HZ	195HP,380V,50HZ	
- Wash Water Pumps			
Number of unit	2	3	2
Each Rated capacity	0.13 m^3/sx15m	0.2 m^3/sx11.6m	0.23 m^3/sxWash rate = 24.4 M/HR - one pump
Motors	25HZp440Vx50HZ	55HPx220Vx50HZ	
Wash Rate Provided (** One pump, one Filter)	1.33 M/MIN	0.34 M/MIN	48.8 M/HR-Two Pumps Back Wash Reser Voir = 400 m^3

(1) Grid channel length = 230 m, further 220 m to No. II, III works

(2) Total cross sectional are of three parallel first stage area = 25 m^2 with a total flow of 3.5 m^3/s, (Rated capacity x 1.66) and velocity = 0.14 m/s

(3) Total cross sectional area of two second stage Grit channels = 16.6 m^2 with flow of 2.3 m^3/s, the velocity = 0.14 m/s

(4) Grit and silt deposited is discharged to the Wonokromo Canal.

Note: * Division of total flow between covered and uncovered Basins is not known. If flow were divided equally on the basis of Tank Surface area, the outflow rate of all units would be 16.74 m^3/day/m^2.

** Usual procedure is to wash at least two filters simultaneously.

TABLE MW- 3(3) EXISTING FACILITIES OF WATER SUPPLY
OF PDAM SURABAYA CITY
(DISTRIBUTING SYSTEM)

Name of Facilities	Description
Distribution Reservoir	
- Name	(1) Wonokitri Reservoir I
	(2) Wonokitri Reservoir II
	(3) Krembangan Elevated Tank
- Capacity (M^3)	(1) - 6,000 / (2) - 12,000 / (3) - 1,500
- Low Water Level (M)	(1) - 19 ASL/ (2) - 19 ASL / (3) - 24 ASL
- Structure	(1) Mansory / (2) Reinforced Concrete /
	(3) Concrete
- Location	(1), (2) South Side of City
	(3) Center of City
Distribution Pump Station	
- Name	(1) Wonokitri Pump Station
	(2) Ngagel Treatment Plant I
	(3) Ngagel Treatment Plant II
	(4) Ngagel Treatment Plant III
- Number of Pump Units	(1) - 5 / (2) = (3) = (4) = (6 x 3) = 18
- Pump Unit Capacity	(1) - 320 L/S x / (2) = (3) = (4) = 250 l/s

TABLE MW- 3(4) EXISTING FACILITIES OF OTHER MUNICIPAL WATER SUPPLY IN BRANTAS RIVER BASIN

(MAIN MUNICIPALS)

Name	Water Source NOS/TYPE/CAP /1	Treatment NOS/PURP/CAP /2	Pump NOS/PURP/CAP /3	Reservoir NOS/TYPE/CAP /4	Remarks /5
PDAM (Kotamadya)					
Malang	5/S/820 l/s	AE=500 l/sec	3/I/510 l/s	3/E/6,000m^3	
		Chlorination	2/B/140 l/s		
			4/B/680 l/s		
Kediri	4/D/125 l/s pumping up	AE=125 l/sec	4/S/80 l/s	1/E/600 m^3	
Mojokerto	5/D/64 l/s	-	2/S/10 l/s	1/E/245 m^3	
	1/S/2 l/s		2/D/12 l/s		

Note : Source - Proyek Air Bersih & Penyehatan, Lingkungan Pemukiman Jawa Timur

/1 : Numbers of sources/Type of sources/Available maximum capacity in total, D = Deepwell; S = Spring; R = Surface water (including river water); CAP = Available maximum raw water capacity in total (lit/sec)

/2 : Numbers of facilities/Purpose/Rated facilities capacity in total, AE = Aeration (lit/sec); CL = Chlorination (kg/hour); EL = Flocculation (lit/sec); SF = Sand filter (lit/sec)

/3 : Numbers of pumps/Purposes/Total capacity (lit/sec); D = Deepwell; I = Intake pump; C = Conveyance pump from source; T = Transmission pump; S = Supply (including distribution) pump; BW = Backwash pump; SW = Surface wash pump; AE = Aeration pump; B = Booster pump.

/4 : Numbers of reservoirs/Type/Effective capacity in total (cubic meter); G = Ground type; E = Elevated type.

/5 : Under construction or planning

TABLE MW- 3(5) EXISTING FACILITIES OF OTHER MUNICIPAL WATER SUPPLY IN BRANTAS RIVER BASIN
(MAIN MUNICIPALS)

Name	Water Source NOS/TYPE/CAP /1	Treatment NOS/PUMP/CAP /2	Pump NOS/PURP/CAP /3	Reservoir NOS/PURP/CAP /4	Remarks /5
PDAM (Kabupaten)					
Malang	23/S/135 l/s	-	6/B/90 l/s	E = 150m^3 G = 100m^3	
Blitar	3/D/5 l/sec	-	1/B/5 l/s 1/D/5 l/s	12 m^3	
Tulungagung	5/D/80.6 l/s	-	5/S/80.6 l/s	-	
Kediri	1/S/5 l/s	-	-	-	
Mojokerto	1/S/35 l/s	CLi=500kg/ month	-	-	
Sidoarjo	1/S/30 l/s 1/R/20 l/s		Gravity Pumping up	1/E/50 1/E/25	Tapping PDAM Surabaya
Gresik	Suci spring S=12.5 l/sec 50 l/sec Pumping & Gravity	Boon cap filtering	1/12.50 l/s 1/50 l/s	1/412m^3	Tapping PDAM Surabaya

Note : Source - Proyek Air Bersih & Penyehatan, Lingkungan Pemukiman Jawa Timur.

/1 : Numbers of sources/Type of sources/Available maximum capacity in total, D = Deepwell; S = Spring; R = Surface Water (including river water); CAP = Available maximum raw water capacity in total (lit/sec)

/2 : Numbers of facilities/Purpose/Rated facilities capacity in total, AE = Aeration (lit/sec); CLi = Chlorination (kg/hour); FL = Flocculation (lit/sec); SF = Sand filter (lit/sec)

/3 : Numbers of pumps/Purposes/Total capacity (lit/sec); D = Deepwell; I = Intake pump; C = Conveyance pump from source; T = Transmission pump; S = Supply (including distribution) pump; BW = Backwash pump; SW = Surface wash pump; AE = Aeration pump; B = Booster pump.

/4 : Numbers of reservoirs/Type/Effective capacity in total (cubic meter), G = Ground type; E = Elevated type

/5 : Under construction or planning

TABLE MW- 3(6) EXISTING FACILITIES OF OTHER MUNICIPAL WATER SUPPLY IN BRANTAS RIVER BASIN (MAIN MUNICIPALS)

Name	Water Source NOS/TYPE/CAP /1	Treatment NOS/PURP/CAP /2	Pump NOS/PURP/CAP /3	Reservoir NOS/TYPE/CAP /4	Remarks /5
BPAM					
Nganjuk Kabupaten	D=40 l/sec	CL=22 kg/Mt	S=40 l/sec	G=800 m^3	
Jombang Kabupaten	S=6.8 l/sec D=60 l/sec Pumping up. Elevation ± 721 m	CL=50 kg/Mt	S=40 l/sec	G=800 m^3	
Blitar Kotamadya	D=60 l/sec Pumping up	-	S=30 l/sec	-	

Note : Source - Proyek Air Bersih & Penyehatan, Lingkungan Pemukiman Jawa Timur.

/1 : Numbers of sources/Type of sources/Available maximum capacity in total, D = Deepwell; S = Spring; R = Surface water (including river water); CAP = Available maximum raw water capacity in total (lit/sec).

/2 : Numbers of facilities/Purpose/Rated facilities capacity in total; AE = Aeration (lit/sec); CL = Chlorination (kg/hour); FL = Flocculation (lit/sec); SF = Sand filter (lit/sec).

/3 : Numbers of pumps/Purposes/Total capacity (lit/sec); D = Deepwell; I = Intake pump; C = Conveyance pump from source; T = Transmission pump; S = Supply (including distribution) pump; BW = Backwash pump; SW = Surface wash pump; AE = Aeration pump; B = Booster pump.

/4 : Numbers of reservoirs/Type/Effective capacity in total (cubic meter); G = Ground type; E = Elevated type.

/5 : Under construction or planning

Table MW- 4 WATER QUALITY OF SPRING WATER

Parameter	Units	Pandaan*	Umbulan
Hardness ($CaCO_3$)	mg/ℓ	104	88
Organic (KMnO4)	mg/ℓ	0.34	1.47
Bicarbonate (HCO3)	mg/ℓ	177	94
Sulfates (SO_4)	mg/ℓ	6.7	1.2
Chlorides (Cl)	mg/ℓ	23	16
Magnesium (Mg)	mg/ℓ	12	9
Calcium (Ca)	mg/ℓ	21	19
Iron (Fe)	mg/ℓ	0.24	0.28
Silica (SiO_2)	mg/ℓ	75	70
Manganese (Mn)	mg/ℓ	0	0
Nitrite (NO_2)	mg/ℓ	0	T
Nitrate (NO_3)	mg/ℓ	0.05	0.05
Sulfide (H_2S)	mg/ℓ	0	0
Ammonia (NH_4)	mg/ℓ	0	0
Pb and Cu	mg/ℓ	0	0
pH	-	7.7	7.0
Date sampled		23/9/75	23/9/75
Laboratory		1	1
Total Solids	mg/ℓ		
TDS	mg/ℓ		
Alkalinity ($CaCO_3$)	mg/ℓ		
pH	-	7.7	7.0
Turbidity	NTU	1.4	0.1
Data sampled		23/9/75	23/9/75
Laboeatory		2	2

* Tamanan reservoir effluent; a composite of all Pandaan springs.

Blanks indicate no data. T = Trace

Laboratyr legend: 1 = Regional Public Health Laboeatory, Surabaya

2 = Nagagel Plant II Laboratory

Table MW-5 STANDARD TABLE OF DRINK WATER QUALITY

(Guideline of Indonesian Republic Ministry of Health
No.01/Birhukmas/1/1975 tanggal 26 April 1975)

No.	Substances	Unit	Conditions Minimally obtained	Conditions Maximally advised	Maximally allowed	Remarks
I	Physics					
1.	Temperature	0°C	-	-	air temp.	
2.	Color	Unit*	-	5	50	*Pt-Co scale
3.	Smell	-	-	-	-	not smelling
4.	Taste	-	-	-	-	not smelling
5.	Turbidity	Unit**	-	5	25	**Silica scale
II	Chemistry					
6.	Acidity (pH)	-	6.5	-	9.2	
7.	Solid matter/Total	mg/l	-	500	1,500	
8.	Organic matter (as $KMnO_4$)	mg/l	-	-	10	
9.	Agressive Carbondi-oxyd (as CO_2)	mg/l	-	-	0.0	
10.	Total	°D	5	-	10	
11.	Calsium (as Ca)	mg/l	-	75	200	
12.	Magnesium (as Mg)	mg/l	-	30	150	
13.	Total Ferum (as Fe)	mg/l	-	0.1	1.0	
14.	Mangaan (as Mn)	mg/l	-	0.05	0.5	
15.	Cuprum (as Cu)	mg/l	-	0.05	1.5	
16.	Zinc (as Zn)	mg/l	-	1.00	15	
17.	Chloride (as Cl)	mg/l	-	200	600	
18.	Sulphat (as SO_4)	mg/l	-	200	400	
19.	Sulfide (as H_2S)	mg/l	-	-	0.0	
20.	Fluoride (as F)	mg/l	1.0	-	2.0	
21.	Amoniac (as NH_4)	mg/l	-	-	0.0	
22.	Nitrate (as NO_3)	mg/l	-	-	20.0	
23.	Nitrict* (as NO_2)	mg/l	-	-	0.0	**Poisonous chemical substance
24.	Phenolic (as phenol)	mg/l	-	0.001	0.002	
25.	Arsen (as As)	mg/l	-	-	0.05	
26.	Plumbum (as Pb)	mg/l	-	-	0.10	
27.	Selenium (as Se)	mg/l	-	-	0.01	
28.	Chronium* (as Cr)	mg/l	-	-	0.05	*Valency of 6
29.	Cyanide* (as Cn)	mg/l	-	-	0.05	
30.	Cadmium* (as Cd)	mg/l	-	-	0.01	
31.	Hydrargyrum* (as Hg)	mg/l	-	-	0.001	
III	Radioactivity					
32.	Alpha Rays	uc/ml	-	-	10^9	
33.	Beta Rays	uc/ml	-	-	10^8	
IV	Micro biologic					
34.	Parasite bacteria	-	-	-	0.0	
35.	Pathogenic bacteria	-	-	-	0.0	
36.	Closect Presumption	-	-	-	0.0	
	Total bacteria of coli class in 100 ml water sample					

Table MW- 6 QUALITY CONDITION OF LIQUID WASTE OF INDUSTRY AND HOUSEHOLD

No.	Parameter	Unit	Minimally allowed	Average in 24 hours	Maximally allowed	Remarks
I	Physical					
1.	Temperature	°C			30	
2.	Floating matter	mg/l			No.	hindered by 3mm nets filter
3.	Precipitated matter	mg/l			1.0	
II	Chemical					
A)	Inorganic chemical					
1.	Total Aluminium	mg/l			10	as Al
2.	Total Arsen	mg/l			1	as As
3.	Barium	mg/l			1 as	as Ba
4.	Total Barium	mg/l			1	as Fe
5.	Chrom	mg/l			0.1	as Cr degree 6
6.	Total Cadmium	mg/l			1	as Cd
7.	Total Nickel	mg/l			2	as Ni
8.	Argentum	mg/l			0.1	as Ag
9.	Total Mercury	mg/l			0.1	as Hg
10.	Total Zink	mg/l			1	as Zn
11.	Total Cuprum	mg/l			1	as Cu
12.	Total Plumbum	mg/l			1	as Pb
13.	Free Amoniac	mg/l			0.1	as NH_3
14.	Free Chlor	mg/l			0.05	as Cl_2
15.	Fluoride	mg/l			2	as ion F
16.	Nitric	mg/l			1	as ion NO_2
17.	Phosphat	mg/l		2		as ion PO_4
18.	Sulfide	mg/l			0.1	as ion S
19.	Biological Oxigen Demand	mg/l		20	30	as O_2
20.	Chemical Oxigen Demand	mg/l		50	80	as O_2
21.	PH		6.5		8.5	
22.	Methylen blue test					Negative
23.	Matter oxidized in $KMNO_4$	mg/l		60	90	
24.	Matter suspensed	mg/l		20		
B)	Organic chemical					
1.	Hydro carbon	mg/l			10	
2.	Oil and fats	mg/l			10	
3.	Total phenol	mg/l			0.1	as phenol
4.	Cyanide	mg/l			0.1	as ion CN

Table MW-7(1) WATER INTAKE FROM K. BRANTAS FOR DOMESTIC, INDUSTRY AND AGRICULTURE

No.	Name of Factories/ Industries	Licenced			Licenses being processed in March of 1985			Total litres/ sec.	Add.
1	2	3	4	5	6	7	8	9	10
1.	PG. Ngadirejo, Kediri	-	400	-	-	-	-	400	
2.	PG. Merican, Kediri	-	300	-	-	-	-	300	
3.	PG. Lestari, Nganjuk	-	600	-	-	-	-	600	Via Canal Kedungkundi
4.	PG. Gempolkrep, Mojokerto	-	870	-	-	-	1.700	2.570	
5.	Pabrik Alkohol & Spiritus Mojokerto	-	10	-	-	-	-	10	
6.	PT. Mertex, Mojokerto	-	50	-	-	-	-	50	
7.	PT. Ajinomoto, Mojokerto	-	300	-	-	-	-	300	
8.	PG. Krian, Sidoarjo	-	300	-	-	-	-	300	Via Mangetan II Canal.
9.	PG. Kremboong, Sidoarjo	-	365	-	-	-	-	365	Via Porong Canal (Canal Se cunder Krembung)
10.	PG. Watutulis, Sidoarjo	-	361	-	-	-	-	361	Via Porong Canal (Canal - Puroboyo I)
11.	PG. Tulangan, Sidoarjo	-	300	-	-	-	-	300	Via Porong Canal (Gedang - rowo Canal)
12.	PG. Candi	-	265	-	-	-	-	265	Via Porong Canal (K. Kedung uling & Bligo Canal)
13.	PT. Miwon Indonesia, Gresik	-	500	-	-	-	-	500	Via Kali Surabaya
14.	PT. Saraswati Bhakti Coated Papers, Sidoarjo	-	95	-	-	-	-	95	Via Mangetan III Canal
15.	PT. Sasa Fermentation Ltd. Sidoarjo	-	10	-	-	-	-	10	Via Mangetan III Canal
16.	PT. Tjiwi Kimia,Sidoarjo	-	20	-	-	500	-	520	Via Mangetan Canal
17.	PN. Soda Waru, Sidoarjo	-	195	-	-	-	-	195	Via Kali Kedung & Canal Secunder Kedungturi
18.	PT. Indo Batt, Sidoarjo	-	0,50	-	-	-	-	0,50	Via Kali Buntung
19.	PT. New Surabaya	-	0,48	-	-	-	-	0,48	Via Afvour Kedung
20.	PT. Sidoarjo Universal Metal Work	-	17,50	-	-	-	-	17,50	Via Betokan Canal
21.	PT. Semen Gresik	-	4,10	-	-	-	-	4,10	Via Afvour Jumundo
22.	Yani Golf Club, Surabaya	-	-	10	-	-	-	10	Via Kali Surabaya
23.	PT. Multi Bintang Indonesia Surabaya	-	17,50	-	-	-	-	17,50	Via Kali Surabaya
24.	PT. Unilever Indonesia, Surabaya	-	200	-	-	-	-	200	Via Kali Mas.
25.	PLN. Exploitasi IX Surabaya	-	225	-	-	-	-	225	Via Kali Mas (Kalibokor Canal)
26.	Pertamina Unit Pengolahan IV Pabrik Aspal Wonokromo, Surabaya	-	12	-	-	-	-	12	Via Kali Surabaya
27.	PT. Keramik Diamond Indah, Surabaya	-	5	-	-	-	-	5	Via Kali Surabaya
28.	PT. Gawerejo, Surabaya	-	1	-	-	-	-	1	Via Kali Surabaya
29.	PT. Spindo, Surabaya	-	17	-	-	-	-	17	Via Kali Surabaya
30.	PD. Nabati Yaşa Unit Pabrik Minyak Goreng Retinery Surabaya	-	12	-	-	-	-	12	Via Kali Mas
31	Proyek Brantas Hilir	15	-	-	-	-	-	15	Via Kali Surabaya

Column 3, 6 ; Drinking Water

Column 4, 7 ; Industrial Water

Column 5, 8 ; Agriculture

Table MW-7(2) WATER INTAKE FROM K. BRANTAS FOR DOMESTIC, INDUSTRY AND AGRICULTURE

No.	2	3	4	5	6	7	8	9	10
	Sub total :	15	5.453,08	10	-	500	1.700	7.678,08	
32.	PDAM. Kotamadya Surabaya	2.000	-	-	-	-	-	2.000	Via Kali Surabaya
33.	PDAM. Kotamadya Surabaya	1.000	-	-	-	-	-	1.000	Via Kali Surabaya
34.	Kebun Binatang Surabaya	-	50	-	-	-	-	50	Via Kali Surabaya
35.	PT. Asia Victory Industri, Surabaya	-	0,115	-	-	-	-	0,115	Via Kali Surabaya
36.	PN. Iglas, Surabaya	-	7	-	-	-	-	7	Via Kali Mas
37.	PT. Suparma, Surabaya	-	60	-	-	-	-	60	Via Kali Surabaya
38.	PT. IKI Mutiara, Surabaya	-	2	-	-	-	-	2	Via Kali Surabaya
39.	PT. Surya Sosro Kencono, Surabaya	-	25	-	-	-	-	25	Via Kali Surabaya
40.	PT. Pabrik Genteng & Batu Bata "Bambe" Surabaya	-	3	-	-	-	-	3	Via Kali Surabaya
41.	PT. Petrokimia Gresik	-	200	-	-	-	-	200	Via Kali Surabaya
42.	PT. Semen Gresik	-	100	-	-	-	-	100	Via Kali Surabaya
43.	PT. Surabaya Agung Kertas, Surabaya	-	60	-	-	-	-	60	Via Kali Surabaya
44.	PT. Jayabaya Raya Surabaya	-	0,35	-	-	-	-	0,35	Via Kali Surabaya
45.	PT. Jawa Kertas, Surabaya	-	25	-	-	-	-	25	Via Kali Surabaya
46.	PT. Wangsa Brata, Surabaya	-	16	-	-	-	-	16	Via Jeblokan Canal
47.	PJKA. Stasiun Gubeng, Surabaya	-	30	-	-	-	-	30	Via Jeblokan Canal
48.	PJKA. Stasiun Sidotopo, Surabaya	-	29	-	-	-	-	29	Via Kaliondo Canal
49.	Pabrik Es "Petojo" Surabaya	-	0,115	-	-	-	-	0,115	Via Jeblokan Canal
50.	Pabrik Tahu (Bambang Gunawan) Surabaya	-	10	-	-	-	-	10	Via Kebonagung Canal
	Total :	3.015	6.070,66	10	-	500	1.700	11.295,66	

Column 3, 6 ; Drinking Water
Column 4, 7 ; Industrial Water
Column 5, 8 ; Agriculture

Table MW- 8(1) PLANNED WATER SUPPLY FACILITIES FOR BNA PROJECTS

(1st STAGE BNA IBRD PROJECT)

Name of Town	/1	Population in 1985 ($x10^3$) In Project Area	Population in 1985 ($x10^3$) In Service Area	Water Demand in 1985 /2 (l/s)	Raw Water Source	Storage Reservoir Capacity (m^3)	/3
Singosari	MA	66.75	40.80	50.0	Spring	800	G
Batu	MA	64.95	43.70	50.0	Spring	860	G
Kepanjen	MA	50.85	31.55	37.0	Spring	500	G
Tulungagung	TU	110.10	68.00	80.0	4 wells	1,000	E
Ngunut	TU	41.80	23.00	27.0	2 wells	500	E
Mojosari	MO	38.00	22.85	26.0	2 wells	500	G
Sidoarjo	SI	70.20	46.20	53.0	2 wells	1,000	E
Krian	SI	63.15	37.20	43.0	2 wells	750	E
Total	-	505.8	313.8	366	-	-	

(2nd STAGE BNA IBRD PROJECT)

Name of Town	/1	Population in 1990 ($x\ 10^3$) In Prouect Area	Population in 1990 ($x\ 10^3$) In Service Area	Water Demand in 1985 /2 (l/s)	Raw Water Source	Storage Reservoir Capacity (m^3)	/3
Wiling	BL	32.95	23.80	27.2	3 wells	600	G
Trenggalek	TR	38.25	29.20	33.3	3 wells	500	G
Pare	KE	62.30	48.45	55.9	3 wells	750	E
Kertosono	NG	42.55	32.60	37.3	3 wells	500	E
Total	-	176.05	134.05	153.7	-	-	

Note : Source - Ref. MW 05, MW 32

/1 : Name of located Kabupaten, MA = Malang; TU = Tulungagung; MO = Mojokerto; TR = Trenggalek; NG = Nganjuk.

/2 : The figures represent the estimated maximum daily water demand in 1985 and 1990 respectively including losses and any incidental supplies at the well field or along the pipeline route.

/3 : G = Ground level storage; E = Elevated storage

Table MW- 8(2) PLANNED WATER SUPPLY FACILITIES FOR IKK PROJECTS

(1st STAGE IKK IBRD PROJECT)

Cities/Towns	Population ($\times 10^3$) 1980	Population ($\times 10^3$) 1985	% Growth P.A.	Served Population in 1985 (in 10^3)	Source Capacity (l/s)	
Bululawang	4.52	4.90	1.63	3.60	2.5	W/1
Turen	11.36	12.32	1.63	7.20	5	W
Bantur	4.55	4.93	1.63	3.60	2.5	W
Donomulyo	3.38	3.66	1.63	3.60	2.5	W
Dampit	10.25	11.12	1.63	7.20	5	S
Gondanglegi	7.27	7.88	1.63	7.20	5	W
Ampelgading	5.59	6.06	1.63	3.60	2.5	S
Pagak	3.48	3.77	1.63	3.60	2.5	S
Sumbermanjingwetan	3.51	3.81	1.63	3.60	2.5	S
(Malang - 9 IKKS)	53.91	58.45	1.63	43.20	30.0	
Puri	3.33	3.65	1.87	3.60	2.5	W
Ngoro	5.32	5.83	1.87	3.60	2.5	W
Bangsal	3.67	4.03	1.87	3.60	2.5	W
Trowulan	4.64	5.09	1.87	3.60	2.5	W
Kemlagi	3.50	3.84	1.87	3.60	2.5	W
Dawarblandong	4.70	5.15	1.87	3.60	2.5	W
(Mojokerto - 6 IKKS)	25.15	27.59	1.87	21.60	15.0	
Taman	19.77	22.65	2.75	14.40	10	W
Tulangan	8.42	9.64	2.75	7.20	5	W
Tanggulangan	12.42	14.23	2.75	7.20	5	W
Wondayu	5.21	5.96	2.75	3.60	2.5	W
(Sidoarjo - 4 IKKS)	45.82	52.48	2.75	32.40	22.5	
Sendang	5.52	5.81	1.02	3.60	2.5	W
Campurdarat	6.88	7.24	1.02	7.20	5	W
Sumbergempol	3.90	4.11	1.02	3.60	2.5	T
Karangrejo	4.18	4.39	1.02	3.60	2.5	W
(Tulungagung - 4 IKKS)	20.48	21.54	1.02	18.00	12.5	
Total 23/KK)	145.36	160.06	1.82	115.2	80	

Note: /1 - S = Spring; W = Well; R = River; T = Tapping from BNA town

Source: MW 07

Table MW- 8(3) PLANNED WATER SUPPLY FACILITIES FOR IKK PROJECTS

(2nd STAGE IKK IBRD PROJECT)

Cities/Towns	Population ($x10^3$) Total 1983	Projected Area 1983	Projected Area 1990	% Growth P.A.	Served Population ($x10^3$) 1990	Source Capacity (l/s)
Sawahan	9.13	4.36	4.83	1.46	2.50	2.5 S[1]
Baron	4.42	4.42	4.89	1.46	2.50	2.5 W
Tanjunganom	27.37	12.59	13.94	1.46	10.80	7.5 W
Gondang	8.72	5.89	6.52	1.46	7.20	5 W
Rejoso	6.38	5.68	6.29	1.46	7.20	5 W
Prambon	5.65	5.65	6.25	1.46	7.20	5 W
Bagor	8.22	6.37	7.05	1.46	7.20	5 W
Nganjuk - 7 IKKS	69.89	44.96	49.77	1.46	44.60	32.5
Papar	6.09	4.89	5.43	1.50	3.60	2.5 W
Ngadiluwih	10.54	9.15	10.16	1.50	7.20	5.0 W
Wates	14.24	13.79	15.31	1.50	10.80	7.5 W
Grogol	13.78	11.99	13.30	1.50	10.80	7.5 W
Semen	4.35	4.35	4.83	1.50	3.60	2.5 W
Gurah	11.87	10.91	12.11	1.50	10.80	7.5 W
Purwoasri	8.37	8.37	9.29	1.50	7.20	5.0 W
Kediri - 7 IKKS	69.24	63.45	70.43	1.50	54.00	37.5
Kanigoro	20.23	16.16	17.39	1.05	14.40	10.0 W
Sanankulon	4.21	4.21	4.53	1.05	3.60	2.5 W
Ponggok	18.79	7.66	8.24	1.05	7.20	5.0 W
Garum	20.25	9.05	9.73	1.05	7.20	5.0 W
Gandusari	5.45	3.64	3.91	1.05	3.60	2.5 W
Talun	12.52	9.64	10.38	1.05	10.80	7.5 W
Blitar - 6 IKKS	81.45	50.36	54.18	1.05	46.80	32.5
Panggul	10.12	7.86	8.43	-	8.43	5.0 W
Kampak	5.24	5.24	5.61	-	3.60	2.5 W
Watulimo	12.41	8.70	9.32	-	7.20	5.0 W
Pule	8.11	4.41	4.73	-	3.60	2.5 R
Bendungan	3.43	2.80	3.00	-	3.60	2.5 R
Mujungan	5.79	4.78	5.13	-	3.60	2.5 W
Dongko	8.17	3.34	3.58	-	3.60	2.5 S
Trenggalek - 7 IKKS	53.27	37.13	39.80	-	33.63	22.5
Total for 2nd IKKS	273.85	195.90	214.18	(1.20)	179.3	S = 2.50 R = 5.0 W = 115.0

Note: /1 - S = Spring; W = Well; R = River; T = Tapping from BNA town

Source: MW 13, MW 14, MW 15

Table MW-.9 REFERENCE POPULATION PROJECTION FOR ENTIRE INDONESIA

	Unit	1975	1980	1985	1990	1995	2000
By Cancus Bureau, U.S.A.							
Total Population							
High	1,000	134,988	150,467	168,155	188,290	210,993	235,720
Medium			150,246	167,005	185,375	205,425	226,388
Low			149,831	164,983	180,321	195,349	209,125
Increase Rate							
Medium	%		2.1	2.1	2.1	2.1	1.9
Mortality Rate	1,000	18.2	16.1	14.3	12.7	11.3	10.2
Birth Rate	1,000	40.3	37.3	35.3	33.4	31.6	28.9
By Community and Family Study Center							
Total Population							
High		130,496	144,184	157,569	170,888	183,491	193,387
Low			144,288	156,848	167,452	176,344	183,839
Growth Rate	%		2.05	1.83	1.59	1.35	1.10
Mortality Rate	/1,000	18.0	14.27	12.93	12.04	11.27	10.65
Birth Rate	/1,000	38.0	32.74	29.99	27.26	24.32	20.55

Table MW-10(1) UNIT WATER DEMAND FOR INDUSTRIES
(PER EMPLOYEE)

Item No.	Kind of Industries	Calculation of make-up water per Employee (m^3/c/d)
31-(A)	Fondstuff, drink, beverages and cigarettes	570 m^3/d (No. 18 - 19) x1/97 x1/4 = 1.47 m^3/c/d
32-(B)	Textiles, ready-made clothing and leathers	(578 m^3/d (No.20) x 1/96 + 27 m^3/d (No.21) x 1/70 + 115 (No.29) x 1/74) x 1/3 x 1/4 = 0.82 m^3/c/d
33-(C)	Wooden wares and furnitures	(65 m^3/d(No.22) x 1/70 + 44 m^3/d(No.23) x 1/76) x ½ x 1/4 = 0.19 m^3/c/d
34-(D)	Paper industry, printing and publishing	(5382 m^3/d(No.24) x 1/100 + 54 m^3/d(No.25) x 1/102) x ½ x 1/4 = 6.79 m^3/c/d
35-(E)	Chemical industry and chemical goods, oil, coal, rubber goods & plastics	(4306 m^3/d(No.26) x 1/187 + 6856 m^3/d(No.27) x 1/269 + 445 m^3/d (No.28) x 1/165) x 1/3 x 1/4 = 4.27 m^3/c/d
36-(F)	Mineral industries exluding metal goods, oil and coal	(296 m^3/d(No.30) x 1/86 + 1671 m^3/d(No.32) x 1/191) x ½ x 1/4 = 1.52 m^3/c/d
37-(G)	Basic Metal Industry	2437 m^3/d(No.31) x 1/225 x 1/4 = 2.71 m^3/c/d
38-(H)	Metal goods, Machine & tools	(98 m^3/d(No.33) x 1/84 + 135 m^3/d(No.34) x 1/138 + 308 m^3/d(No.36) x 1/259 + 91 m^3/d(No.37) x 1/143 + 372 m^3/d(No.38) x 1/268) x 1/5 x 1/4 = 0.27 m^3/c/d
39-(I)	Other industries	(137 m^3/d(NO.35) x 1/166 + 256 m^3/d(No.39) x ½ x 1/4 = 0.46 m^3/c/d

The number of employees for each kinds of industries in Indonesia is estimated four times of Japanese data

Source : Japan land establishing center March, 1983
(Authorized by Japan Ministry of Industry & Commerce)

Table MW-10(2) UNIT WATER DEMAND FOR INDUSTRIES
(PER LAND AREA)

No.	Kind of Industries	Calculation of make-up water per land area ($m^3/ha/d$)
(a)	Foodstuffs, drinks and Beverages	43.0(No.18 & 19) x 0.8 = 34.4 $m^3/day/10^3m^2$ = 344 $m^3/ha/d$ = 3.98 l/ha/s
(b)	Textiles and ready-made clothing	(46.3(No.20) + 8.5(No.21)) x 0.8/2 = 21.9 $m^3/d/10^3m^2$ = 219 $m^3/ha/d$ = 2.53 l/ha/s
(c)	Publishing and Printing Wooden wares and Furnitures	(18.1(No.25) + 3.2(No.22) + 4.0(No.23)) x 0.8/3 = 6.74 $m^3/d/10^3m^2$ = 67 $m^3/ha/d$ = 0.77 l/ha/s
(d)	Chemical and Rubber goods, Leather and Ceramic	(174.3(No.24) + 55.8(No.26) + 15.5(No.27) + 20.8(no.28) + 22.2(No.29) + 9.7 (NO.30))x 0.8/6 = 39.8 $m^3/d/10^3m^2$ = 400 $m^3/ha/d$ = 4.63 l/ha/s
(e)	Metal products, bycycles and the Parts	(21.6(No.31) + 24.3(No.32) + 7.5(No.33) + 6.7(NO.34) + 7.4(No.36) + 11.0(No.37) + 0.6(No.38) 20.5(No.39)) x 0.8/8 = 9.96 $m^3/d/10^3m^2$ = 100 $m^3/ha/d$ = 1.16 l/ha/s
(f)	Electric appliances	11.5(No.35) x 0.8 = 9.2 $m^3/d/10^3m^2$ = 92 $m^3/ha/d$ = 1.06 l/ha/s
(g)	Construction materials	(2.8(No.303) + 21.6(No.31) + 24.3(No.32)) x 0.8/3 = 12.99 $m^3/d/10^3m^2$ = 130 $m^3/ha/d$ = 1.50 l/ha/s
(h)	Cigarettes, etc. (including other miscellaneous industries)	6.8(no.398---399) x 0.8 = 5.44 $m^3/d/10^3m^2$ = 55 $m^3/ha/d$ = 0.63 l/ha/s

Source : Japan land establishing center March, 1983
(Authorized by Japan Ministry of Industry & Commerce)

Table MW-11. SAMPLE OF ACTUAL ABSTRACTION RETURN AND NET CONSUMPTION ESTIMATED BY SURABAYA WATER USE STUDY

Licence Holder	Licensed Abstraction (l/sec)	Estimated Actual Abstraction[1] (l/sec)	Estimated Effluent returns (l/sec)	Net Consumption[1] (l/sec)
P.L.N.	225	(200)	(150)	(50)
Pabrik Semen Gresik	100	60	NIL	60
P.T. Miwon	500	420	340	80
P.T. Petrokimia	200	250	30	220
Pabrik Es Ngagel	170	NIL	-	-
Others	411.7	400	200	200
Unlicensed Offtakes	-	400	200	200
TOTAL FROM MAS AND SURABAYA RIVERS	1606.7	1530[2]	770[2]	760[2]
Sugar Factories	1556	1300	1170	130
P.T.P. Ratatex	125	100	50	50
PN Soda Waru	195	160	80	80
Others	40.75	40	20	20
TOTAL FROM DELTA CANALS	1916.75	1600	1320	280
P.T. Ajinomoto	465	300	270	30
P.T. Mertex	200	25	NIL	25
Others	10	10	NIL	10
TOTAL FROM K. BRANTAS MOJOKERTO-LENGKONG	675	335	270	65
TOTAL	4198.45 (100%)	3465 (83%)	2360 (56%)	1105 (26%)

1. Based on data obtained from the Gresik pumping stations, P.T. Miwon, Pabrik Es Ngagel, P.G. Krian, PT Ajinomoto and PT Mertex.
2. Excluding PLN, abstractions for which are measured at the Kalibokor canal offtake.

Table MW-12(1) BREAK DOWN OF DOMESTIC WATER DEMAND

	1980	1985	1990	1995	2000	2005	2010	2015	2020
SMA									
Population	2,867,477	3,465,000	4,187,000	5,060,400	6,119,000	7,395,400	8,938,100	10,802,600	13,056,000
Unit demand l/c/d	93.6	107.0	119.3	132.0	149.3	158.5	167.5	179.0	190.0
Net demand m^3/d	272,869	370,755	499,509	667,972	913,567	1,172,171	1,497,132	1,933,665	2,480,640
Demand incl. A.C.F.	327,443	444,906	599,411	801,566	1,096,280	1,406,605	1,796,558	2,320,398	2,976,768
l/s	3,800	5,100	6,900	9,300	12,700	16,300	20,800	26,900	34,500
LARGE URBAN									
Unit demand l/c/d	91.9	100.5	109.0	106.0	123.0	130.5	137.5	143.5	150.0
Blitar									
Population	75,509	85,400	96,700	109,400	123,700	140,000	158,400	179,200	202,700
Net demand m^3/d	6,939	8,583	10,540	12,690	15,215	18,270	21,780	25,715	30,405
Non-domestic	2,082	2,575	3,162	3,807	4,565	5,481	6,534	7,715	9,122
Demand incl. A.C.F.	10,825	13,390	16,442	19,796	23,736	28,501	33,977	40,116	47,432
l/s	125	155	190	229	275	330	393	464	549
Kediri									
Population	173,433	196,200	222,000	251,200	284,200	321,500	363,800	411,600	465,700
Net demand	15,938	19,718	24,198	29,139	34,957	41,956	50,023	59,065	69,855
Non-domestic	4,781	5,915	7,259	8,742	10,487	12,587	15,007	17,720	20,957
Demand incl. A.C.F.	24,863	30,760	37,748	45,457	54,533	65,452	78,036	92,142	108,974
l/s	288	356	437	526	631	758	903	1,066	1,261
Malang									
Population	469,660	531,400	601,200	680,200	769,600	870,700	985,100	1,114,600	1,261,100
Net demand	43,161	53,406	65,531	78,900	94,661	113,626	135,451	159,945	189,165
Non-domestic	12,948	16,022	19,659	23,670	28,398	34,088	40,635	47,984	56,750
Demand incl. A.C.F.	67,331	83,314	102,228	123,084	147,671	177,257	211,303	249,515	295,098
l/s	779	964	1,183	1,425	1,709	2,052	2,446	2,888	3,415
Mojokarto									
Population	68,507	77,500	87,700	99,200	112,300	127,000	143,700	162,600	183,900
Net-demand	6,296	7,789	9,559	11,507	13,813	16,574	19,759	233,331	27,585
Non-domestic	1,889	2,337	2,868	3,452	4,144	4,972	5,928	6,999	8,276
Demand incl. A.C.F.	9,822	12,151	14,912	17,951	21,548	25,855	30,824	36,396	43,033
l/s	114	141	173	208	249	299	357	421	498
OTHER URBAN									
Unit demand	80.0	83.5	87.0	89.5	92.0	94.0	96.0	98.0	100.0
Trenggalek									
Population	29,318	33,200	37,500	42,500	48,000	54,400	61,500	69,600	78,800
Net demand	2,345	2,772	3,263	3,804	4,416	5,114	5,904	6,821	7,880
Non-domestic	469	554	653	761	883	1,023	1,181	1,364	1,576
Demand incl. A.C.F.	3,377	3,991	4,699	5,478	6,359	7,364	8,502	9,822	11,347
l/s	39	46	54	63	74	85	98	114	131
Tulungagung									
Population	178,094	201,500	228,000	257,900	292,100	330,200	373,000	422,700	478,000
Net demand	14,248	16,825	19,836	23,083	26,873	31,039	35,808	41,425	47,800
Non-domestic	2,850	3,365	3,967	4,617	5,375	6,208	7,162	8,285	9,560
Demand incl. A.C.F.	20,518	24,228	28,564	33,240	38,698	44,696	51,564	59,652	68,832
l/s	237	280	331	385	448	517	597	690	797
Blitar									
Population	66,404	75,100	85,000	96,200	108,700	123,100	139,300	157,600	178,400
Net demand	5,312	6,271	7,395	8,610	10,000	11,571	13,373	15,445	17,849
Non-domestic	1,062	1,254	1,479	1,722	2,000	2,314	2,675	3,089	3,568
Demand incl. A.C.F.	7,649	9,030	10,649	12,398	14,400	16,662	19,258	22,241	25,690
l/s	89	105	123	143	167	193	223	257	297
Kediri									
Net demand	79,576	90,000	101,800	115,200	130,300	147,500	166,800	188,900	213,600
Non-domestic	6,366	7,515	8,857	10,310	11,988	13,865	16,013	18,517	21,360
Demand incl. A.C.F.	1,273	1,503	1,771	2,062	2,398	2,773	3,203	3,707	4,272
l/s	9,167	10,822	12,754	14,846	17,263	19,966	23,059	26,657	30,758
	106	125	148	172	200	231	267	309	356

Table MW-12(2) BREAK DOWN OF DOMESTIC WATER DEMAND

	1980	1985	1990	1995	2000	2005	2010	2015	2020
Malang									
Net demand	194,069	219,600	248,300	281,100	317,800	359,800	407,100	469,600	521,000
Non-domestic	15,525	18,337	21,602	25,158	29,238	33,821	39,082	45,139	52,100
Demand incl. A.C.F.	3,105	3,667	4,320	5,032	5,848	6,764	7,816	9,028	10,420
ℓ/s	22,356	26,405	31,106	36,228	42,103	48,702	56,278	65,000	75,024
	259	306	360	419	487	564	651	752	868
Sidoarje									
Net demand	55,273	62,500	70,800	80,100	90,600	102,500	115,900	131,200	148,400
Non-domestic	4,422	5,219	6,160	7,169	8,335	9,635	11,126	12,858	14,840
Demand incl. A.C.F.	884	1,044	1,232	1,434	1,671	1,927	2,225	2,572	2,968
ℓ/s	6,367	7,516	8,870	10,324	12,031	13,874	16,021	18,516	21,370
	74	87	103	119	139	161	185	214	247
Mojokerto									
Net demand	47,848	54,100	61,200	69,300	78,500	88,700	100,500	113,600	128,400
Non-domestic	3,828	4,517	5,324	6,202	7,222	8,338	9,648	11,133	12,840
Demand incl. A.C.F.	766	903	1,065	1,240	1,444	1,668	1,930	2,227	2,568
ℓ/s	5,513	6,504	7,667	8,930	10,399	12,007	13,894	16,032	18,490
	64	75	89	103	120	139	161	186	214
Jombang									
Net demand	109,492	123,900	140,200	158,600	179,500	203,000	229,700	259,800	294,200
Non-domestic	8,759	10,346	12,197	14,195	16,514	19,082	22,051	25,460	29,420
Demand incl. A.C.F.	1,752	2,069	2,439	2,839	3,303	3,816	4,410	5,092	5,884
ℓ/s	12,613	14,898	17,563	20,441	23,780	27,478	31,753	36,662	42,365
	146	172	203	237	275	318	268	424	490
Nganjuk									
Net demand	87,832	99,400	112,500	127,200	144,000	162,800	184,200	208,400	235,800
Non-domestic	7,027	8,300	9,788	11,384	13,248	15,303	17,683	20,423	23,580
Demand incl. A.C.F.	1,405	1,660	1,958	2,277	2,650	3,061	3,537	4,085	4,716
ℓ/s	10,118	11,952	14,095	16,393	19,078	22,037	25,464	29,410	33,955
	117	138	163	190	221	255	295	340	393
RURAL AREA									
Unit demand ℓ/c/d	30	33.8	37.5	41.3	45	48.8	52.5	56.3	60
Trenggalek									
Net demand	535,224	547,300	555,000	569,200	561,500	558,300	548,400	531,400	505,800
Non-domestic	16,057	18,465	20,813	23,508	25,268	27,245	28,791	29,918	30,348
Demand incl. A.C.F.	803	923	1,041	1,175	1,263	1,362	1,440	1,496	1,517
ℓ/s	19,389	22,296	25,132	28,385	30,511	32,868	34,766	36,126	36,645
	224	258	291	329	353	381	402	418	424
Tulungagung									
Net demand	655,229	659,400	657,500	648,300	629,600	601,100	558,000	499,000	421,300
Non-domestic	19,657	22,288	24,656	26,775	28,332	29,334	29,334	29,334	29,334
Demand incl. A.C.F.	983	1,114	1,233	1,339	1,417	1,467	1,467	1,467	1,467
ℓ/s	23,736	26,912	29,772	32,331	34,211	35,421	35,421	35,421	35,421
	275	311	345	374	396	410	410	410	410
Blitar									
Net demand	973,800	990,900	1,002,200	1,005,400	998,100	980,200	945,300	893,000	819,300
Non-domestic	29,214	33,492	37,583	41,523	44,915	47,834	49,628	50,276	50,276
Demand incl. A.C.F.	1,461	1,675	1,879	2,076	2,246	2,392	2,481	2,514	2,514
ℓ/s	35,276	40,442	45,381	50,139	54,235	57,760	59,925	60,709	60,709
	408	468	525	580	628	669	694	703	703
Kadiri									
Net demand	1,209,086	1,265,500	1,314,100	1,351,500	1,373,000	1,379,300	1,357,200	1,304,300	1,213,800
Non-domestic	36,273	42,774	40,279	55,817	61,785	67,310	71,253	73,432	73,432
Demand incl. A.C.F.	1,814	2,139	2,464	2,791	3,089	3,366	3,563	3,672	3,672
ℓ/s	43,800	51,650	59,504	67,399	74,605	81,277	86,038	88,670	88,670
	507	598	689	780	863	941	996	1,026	1,026
Malang									
Net demand	1,893,990	1,976,400	4,042,800	2,086,300	2,096,500	2,073,500	1,992,200	1,850,800	1,628,300
Non-domestic	56,820	66,802	76,605	86,164	94,343	101,187	104,591	104,591	104,591
Demand incl. A.C.F.	2,841	3,340	3,830	4,308	4,717	5,059	5,230	5,230	5,230
ℓ/s	68,610	80,663	92,500	104,043	113,919	122,183	126,294	126,294	126,294
	794	934	1,071	1,204	1,319	1,414	1,462	1,462	1,462

Table MW- 12(3) BREAK DOWN OF DOMESTIC WATER DEMAND

	1980	1985	1990	1995	2000	2005	2010	2015	2020
Sidoarjo									
Net demand	295,908	329,600	364,300	398,000	429,200	458,000	478,700	489,900	488,500
Non-domestic	8,877	11,140	13,661	16,437	19,314	22,350	25,132	27,581	29,310
Demand incl. A.C.F.	444	557	683	822	966	1,118	1,257	1,379	1,466
ℓ/s	10,719	13,452	16,496	19,848	23,322	26,988	30,347	33,304	35,392
	124	156	191	230	270	312	351	385	410
Mojokerto									
Net demand	658,090	698,600	736,000	768,400	792,600	809,100	809,900	793,900	757,100
Non-domestic	19,743	23,613	27,600	31,735	35,667	39,484	42,520	44,697	45,426
Demand incl. A.C.F.	987	1,181	1,380	1,587	1,783	1,974	2,126	2,235	2,271
ℓ/s	23,840	28,513	33,327	38,320	43,068	47,677	51,343	53,972	54,852
	276	330	386	444	498	552	594	625	635
Jambang									
Net demand	854,156	901,600	945,600	983,700	1,013,000	1,034,400	1,039,100	1,026,200	990,900
Non-domestic	25,625	30,474	35,460	40,627	45,585	50,479	54,553	57,775	59,454
Demand incl. A.C.F.	1,281	1,524	1,773	2,031	2,279	2,524	2,728	2,889	2,973
ℓ/s	30,942	36,798	42,818	49,057	55,044	60,953	65,873	69,764	71,791
	358	426	496	568	637	705	762	807	831
Nganjuk									
Net demand	795,000	830,400	861,700	887,000	904,300	913,600	908,100	887,000	846,600
Non-domestic	23,850	28,068	32,314	36,633	40,694	44,584	47,675	49,938	50,796
Demand incl. A.C.F.	1,193	1,403	1,616	1,832	2,035	2,229	2,384	2,497	2,540
ℓ/s	28,799	33,892	39,020	44,235	49,138	53,835	57,568	60,300	61,336
	333	392	452	512	569	623	666	698	710

Table MW-13 NET CONSUMPTION OF WATER INCLUDED IN THE PRESENT HYDROLOGICAL CYCLE

Area	Household			Piped Water Household			Served
	Urban	Rural	Total	Urban	Rural	Total	Ratio
Blitar	14,628	208,560	223,188	21	3,482	3,503	0.016
Kediri	15,401	245,705	261,106	21	809	830	0.003
Malang	38,053	400,067	438,120	6,235	21,588	27,823	0.064
Mojokerto	9,667	146,037	155,704	316	4,756	5,072	0.033
Jombang	20,519	178,978	299,497	237	2,102	2,339	0.011
Nganjuk	17,276	172,338	189,614	42	1,311	1,353	0.007
Sidoarjo	33,939	136,790	170,729	9,601	762	10,363	0.061
Kotamadya							
Kediri	33,431	9,292	42,723	733	-	733	0.017
Blitar	15,060	573	15,633	63	-	63	0.004
Malang	90,145	7,819	97,964	17,127	38	17,165	0.175
Mojokerto	13,429			536	-		0.040
Surabaya	359,436	58,045	417,481	316,141	25,375	341,516	0.818

Area	Population	Unserved Ratio	Unserved Population	Present m^3/d	Net Use m^3/d	Water Supply System
Blitar	1,037,175	0.984	1,020,580	20,412	0.236	0.042
Kediri	1,235,026	0.997	1,231,321	24,626	0.285	0.070
Malang	2,045,704	0.936	1,914,779	38,296	0.443	0.534
Mojokerto	853,685	0.967	825,513	16,510	0.191	0.042
Jombang	705,547	0.989	697,786	13,956	0.162	0.025
Nganjuk	941,789	0.993	935,196	18,704	0.216	0.028
Sidoarjo	882,607	0.939	828,768	16,575	0.192	
Kotamadya						
Kediri	221,636	0.983	217,868	4,357	0.050	
Blitar	78,381	0.996	78,067	1,561	0.018	
Malang	510,906	0.825	421,497	8,430	0.098	
Mojokerto	68,507	0.960	65,767	1,315	0.015	
Surabaya	2,017,527	0.182	367,190	7,344	0.085	
T o t a l					1,991	0.741

Table MW-14 FUTURE POTENTIAL NON DOMESTIC WATER IN SMA

Industrial Water	1990	2000	2010	2020
Employee in secondary sector	308.029	584.770	1.067.162	1.947.490
Unit demand per employee (l/c/d)	200*	500*	500	500
Demand (m^3/d)	61.606	292.385	533.581	973.745
	0.71	3.38	6.18	11.27

P o r t	1990	2000	2010	2020
Total cargo handling (10^3 t)	10.714	25.054	58.587	13.700
Unit demand (l / 1000 t)	0.209*	0.143*	0.124	0.103
Demand	2.241	3.592	7.258	14.170
	0.03	0.04	0.08	0.16

Commercial	1990	2000	2010	2020
Tertiary sector GRDP at 1975 price	294.384	1.047.463	1.975.483	3.725.699
Unit demand (l / Rp. 10^6)	130.3*	68.85*	68.85	68.85
Demand (m^3/d)	38.349	72.122	136.020	256.529
(m^3/s)	0.44	0.83	1.60	3.00

S o c i a l	1990	2000	2010	2020
Population x 10^3	4.186.6	6.119.4	8.938.1	13.056.0
Unit demand (l/c/d)	8.1*	8.1*	8.1	8.1
Demand (m^3/d)	33,919	49,584	72,399	105,734
(m^3/s)	0.39	0.57	0.84	1.23

Note; Estimates up to the year 200 are taken from Urban Development Study
Year 2010 and 2020 are estimated by Study Team.
Unit demands marked by * are calculated by dividing the water demand by respective demand.

Table MW-. 15 SAMPLES OF CONSTRUCTION COST

Project	Construction as of estimate at Rp 10^6	Cost 1984 p.l. Rp 10^6	Supply Capacity m^3/max. day	Unit Cost Rp $10^3/m^3$/day
Umbulan Spring /1	135,000	135,000	210,365	642
Karangpilang Treatment /2	15,265	16,792	75,130	224
BNA /3	14,560	17,618	43,474	405
IKK /3	7,253	8,776	16,101	545

Note; /1 Excluding costs for treatment plant and distribution system

/2 Excluding cost for distribution system

/3 Cost from source works up to distribution system

Table MW - 16 COST ESTIMATE FOR DOMESTIC WATER SUPPLY DEVELOPMENT

	Period							
	1985	1986 1990	1991 1995	1996 2000	2001 2005	2006 2010	2011 2015	2016 2020
Water Demand (x 10^6 m^3/day)								
SMA	444.9	599.4	801.5	1,096.2	1,406.1	1,796.5	2,320.4	2,976.7
Urban	276.8	307.3	364.5	431.6	524.9	600.0	702.0	822.2
Rural	312.6	384.1	433.8	478.1	518.9	547.5	564.5	571.2
Increment in 5 years (x 10^6 m^3/day)								
SMA	-	154.5	202.1	294.7	309.9	390.4	523.9	656.3
Urban	-	30.5	57.2	67.1	83.3	85.1	102.0	120.2
Rural	-	71.5	49.7	44.3	40.8	28.6	17.0	6.7
Development Cost in 5 years (Rp. 10^6)								
SMA (x Rp 629x 10^3 m^3)	-	97,181	127,121	185,360	194,927	245,562	329,533	412,813
Urban (xRp 405x10^3 m^3)	-	12,353	23,166	27,176	33,737	34,466	41,310	48,681
Rural (xRp 545x10^3 m^3)	-	38,968	27,087	24,144	22,236	15,587	9,265	3,652
Total	-	148.502	177,374	236,680	250,800	295,615	380,108	415,146
Average Annual Cost (Rp 10^6)	-	29,700	88,687	47,336	50,180	59,123	76,022	93,029

ANNEX RC

FLOOD CONTROL PLAN STUDY

ANNEX-RC

FLOOD CONTROL PLAN

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Note RC-1 ESTIMATION OF VALUE OF DAMAGEABLE PROPERTY

1. General

The objective of this section is to estimate value of damageable properties relating to inundation area of the Brantas basin. Since it was difficult to have access to appropriate data on value of damageable properties mentioned above, the basic calculations of them are mostly based on economic or statistical data on various fields of general economy. Further, statistics of provincial level (East Java) was used in case statistics covering the basin's economy were not sufficient to estimate value of related properties.

The components of damageable properties are on the basis of land use categories which are derived from classification of mesh survey discussed in sub-section 3.5.3. Damageable properties are as follows:

- agricultural crops; paddy, maize, soybean, and peanut
- buildings; house, factory, commercial building, and hotel/ restaurant/store
- fish pond
- infrastructure

Property value of buildings are further classified into building cost and indoor movables. Property value of fish pond also consists of value of fish and fish pond facility. The method over estimation of property value is to calculate unit value of each item by using available statistical data on them. Unit value of them was estimated at both present and future condition. Present and future unit value of each item are shown at 1984 constant price.

The number or area of each property is estimated from mesh survey discussed in sub-section 3.5.3. As far as future condition is concerned, estimation was applied to future increase rate of buildings.

2. Agricultural crops

The crops associated with inundation area of the basin are paddy, maize, soybean and peanuts. For the estimation of crops' value at present and future condition, price projection and unit yield of crops are required.

(1) Price projection

For the purpose of estimating present and future price of related crops, "Price Prospect for Major Primary Commodities" issued in Dec., 1983 by the World Bank was used. Economic price of crops was fixed at farm gate price. Because of no data on future price after 1995 with respect to the above reference, price in 2000 and after 2000 is shown at price of the year 1995. As shown in Table RC-9 through RC-12 future prices (the year 1995) of crops are projected at 1984 constant price.

(2) Unit yield of crops

Present average unit yield of crops in the Kab/Kodya relating to the basin in 1984 are estimated based on the average unit yield of crops between 1980 and 1983. Unit yield of low land paddy is shown in terms of clean dry paddy, which is equivalent to dry paddy at farm gate price. As shown in section 3.2, future unit yield of low land paddy in 2000 is assumed to be 5.5 ton/ha in terms of clean dry paddy. Anticipated unit yield of maize, soybean and peanut are also assumed to be 3.5, 1.4 and 1.5 ton/ha respectively in 2000. After 2000, unit yield of crops in assumed to be the same as that in 2000. The following table shows average unit yield of each crop in the Kab/Kodya relating to the Brantas basin in selected years between 1984 and 2000.

Unit: ton/ha

	1984	1990	1995	2000
Paddy	3.91	4.44	4.94	5.50
Maize	1.69	2.22	2.79	3.50
Soybean	0.75	0.95	1.15	1.40
Peanut	0.79	0.95	1.11	1.30

(3) Unit value of crops

Unit value of crops per ha is calculated in such a way that average unit yield of crops per ha in the basin is multiplied by projected price of crops per ton. As far as the secondary crops are concerned, the average value of them is taken up as the value of these crops. The following table shows value of crops per ha in 1984, 1990 and 2000.

Unit: Rp

	1984	1990	2000
Paddy	648,360	1,143,620	1,397,390
Maize	305,280	414,740	657,480
Soybean	265,260	368,290	538,410
Peanut			

3. Unit cost of buildings

Kinds of buildings relating to the inundation area of the basin are as follows:

- house (urban, rural)
- factory
- commercial building
- hotel/restaurant/store

(1) Unit cost per building

In order to estimate unit cost of buildings, unit cost per m^2 of buildings has to be evaluated. Unit cost per m^2 of house in 1984 was practically surveyed. Unit cost of other buildings in 1984 was provided by Cipta Karya. The following assumptions were applied to estimate future unit cost.

- the past trend of mortgage rate between 1979 and 1983 was tentatively used to evaluate current value of each building in 1990 and 2000.
- consumer price index (CPI) was used as deflator to obtain the value of buildings at 1984 constant price.

The details of them is shown in Table RC-13. As shown in Table RC-14 projection of unit cost per m^2 after 2000 is based on diminishing rate of increase which is estimated at 90% of the growth rate of unit cost per m^2 during previous decades.

Unit cost per building in 1984 is shown in the following table.

	House		Building		
	Rural	Urban	Industry	Commercial	Hotel/Store
Unit cost per m^2 /1	32.9	39.1	220	180	145
Standard size of house /2	50 m^2	120 m^2			
Average number of floor			1	2 /3	1
Average floor area			2,500 m^2	(1,090) m^2	300 m^2 /4
Salvage value of building	10% of construction cost				
Value of buildings (10^3) Rp.	905	2,580	302,500	107,910	23,925

Remarks: /1, /2 Source: Directorate General of Cipta Karya
/3 - Based on an assumption of 2 floor, value of building is equal to (unit cost x floor area)
/4 - Based on an assumption of 1 floor, average floor area is assumed to be 300 m^2.

Values of buildings in 1984 were estimated in the table above, by taking into account of salvage value of existing buildings. Based on future unit cost per m^2 at 1984 constant price shown in Table RC-14, future increase of building cost was estimated in Table RC-15 by referring to the above table.

(2) Future increase of buidling

Future increase of buildings other than houses will be discussed in sub-section of indoor movables. Here, a forcus is put on the increase rate of houses. The following assumptions were made to estimate the increase rate of houses.

- although inundation area covers the district of Surabaya, an attention is concentrated on Brantas basin excl. SMA/1 because inundation area mostly covers other areas than SMA.

- accommodated persons per household are also estimated by taking account into present family size.

/1 SMA (Surabaya Metropolitan area)

Based on the above two assumptions, the number of houses are calculated in urban and rural areas in 1985, 2000, 2020, and 2060. The increase rate of houses are shown in urban and rural areas respectively shown in Table RC-16. Future increase of buildings is summarized in Table RC-17.

4. Value of indoor movables

Value of indoor movables are estimated by categories of buildings relating to inundation area. In general, value of indoor movables are estimated as stock value of them by each type of building. Future value of them are shown at 1984 constant price. In case statistics covering the basin's economy are not sufficient to estimate the value of indoor movables, statistics of East Java were used.

(1) Household effects

As shown in Table RC-18, selected items of household are food, furnishing equipments, clothes, and so on. Due to the household expenditure survey in the basin area, the following procedure is introduced to estimate average value of household effects.

(a) In the first place, average monthly household expenditure is calculated by expenditure items in the Brantas Basin in 1983.

(b) Value of each item is estimated as stock value in such a way that food is equivalent to one day family expenditure and so on. As to the rest of items, conditions are given in Table RC-18.

(c) Total amount of household effect is estimated to be 679,390 Rp. in 1983. In much the same way, they are estimated to be 530,551 Rp. and 547,121 Rp. in 1981 and 1982 respectively.

(d) Estimated amount of household effect in 1984 is estimated based on the rate of increase of CPI (Consumer Price Index) between 1983 and 1984.

Future increase of household effect is estimated as follows:

(e) CPI will increase at a rate of 15.4% p.a. up to 2000, which is based on rate of increase of CPI between 1970 and 1983.

(f) Value of household effect (current price) is assumed to increase at a growth rate of 18.4% up to 2000 year on the basis of the rate of change of average per capita consumption (Indonesia) between 1970 and 1980.

(g) As a result of assumptions of (1) and (2), value of household effect in 2000 is estimated to be 1,124,144 Rp. at 1984 constant price, which is shown in Table RC-19.

(h) Projection of household effect after 2000 is based on the diminishing rate of increase which is estimated at 90% of the growth rate of household effect during previous decades.

(2) Hotel/restaurant/store

The following procedures are taken up in order to estimate stock value of indoor movables relating to the above type of building. It is assumed that the number of stores constitutes the majority of this sector. So, the value of indoor movables is estimated as stock value of stores.

(a) In the first place, the number of building in above sector must be calculated. Total population engaged in this sector of East Java was about 1,677,765 people in 1980. Although the number of working people per hotel/restaurant is different from the number of them per store, it is tentatively assumed that the number of stores constitutes the majority of this sector. Since the size of store is comparatively small in the form of household store, the number of working people per building is assumed to be 4 persons. Total number of building is estimated to be 419,441 in East Java in 1980.

(b) Value of properties can be estimated as stock value. According to Table 12, the monthly per capita income (East Java) is about 30,500 Rp. The ratio of expenditure to income is assumed to be 56%, based on interview survey. Monthly per capita expenditure turned out to be about 17,080 Rp. Percentage of expenditure items out of total monthly expenditures are 65% (food), 8.6% (miscellaneous goods), 5.6% (clothes), and 3.5% (durable goods), which is based on

the National Socio-Economic Survey in 1980. Due to no data on expenditure survey in 1984, monthly expenditure in 1984 is adjusted to that in 1980.

(c) It is tentatively estimated that stock value of food, miscellaneous goods, clothes and durable goods are equivalent to two weeks, two months, two months and one year expenditure respectively. They are expressed as follows:

17,080 x 0.65 x 0.5 = 5,551 Rp. (Foods)
17,080 x 0.086 x 2 = 2,937 Rp. (Miscellaneous goods)
17,080 x 0.056 x 2 = 1,913 Rp. (Clothes)
17,080 x 0.08 x 12 = 16,396 Rp. (Durable goods)

(d) Number of buildings in East Java in 1984 is projected to be 454,016, based on 1.9% rate of increase p.a. As a result, the average stock value per building are estimated in the following way.

$$(5,551 + 2,937 + 1,913 + 16,396) \times 30,868 \times 10^3 \div 454,016$$
$$= 1.82 \times 10^6 \text{ Rp.}$$

The population in East Java is estimated to be $30,868 \times 10^3$ in 1984, which is seen in Statistic Indonesia, 1983.

Future increase of properties' value is expressed as follows:

(e) The monthly per capita income is projected to be 38,730 Rp. in 1990, which is shown in Table RC-20. The ratio of expenditure to income is assumed to be 56% too. The monthly expenditure in 1990 is adjusted to that in 1980 so as to get percentage of expenditure items out of total monthly expenditures. Monthly per capita expenditure is assumed to be 21,688 Rp. Percentage of expenditure items out of total monthly expenditure would be 40% (foods), 16% (miscellaneous goods), 5% (clothes) and 9% (durable goods).

(f) In much the same way, stock value will be calculated as follows:

21,688 x 0.4 x 0.5 = 4,338 Rp. (Foods)
21,688 x 0.16 x 2 = 6,940 Rp. (Miscellaneous goods)
21,688 x 0.05 x 2 = 2,169 Rp. (Clothes)
21,688 x 0.09 x 13 = 23,423 Rp. (Durable goods)

(g) The population and the number of buildings are projected to be $33,139 \times 10^3$ and 511,296 respectively in 1990. In short, the average stock value per building in 1990 would be calculated as below:

$$(4,338 + 6,940 + 2,169 + 23,423) \times 31,139 \times 10^3 \div 511,296$$
$$= 2.39 \times 10^6 \text{ Rp.}$$

(h) The same procedures as what is mentioned so far are tentatively applied to estimate average stock value per building in 2000. The monthly expenditure is projected to be about 32,300 Rp. The stock value per building is estimated to be 3.27×10^6 Rp.

(i) GRDP and Population after 2000 is shown in Table RC-20. The growth rate of GRDP is estimated to be 4% and 3.5% p.a. during 2000 - 2020 and 2020 - 2060. The growth rate of population is estimated to be 1.09%, 1.04% and 0.99% p.a. every successive two decades after 2000. The ratio of monthly expenditure to income is assumed to be 50%, 45% and 40% every successive two decades after 2000. The monthly expenditure is projected to be 50,874 Rp., 74,076 Rp. and 107,589 Rp. in 2020, 2040 and 2060 respectively.

(j) Assuming that stock value per building is in proportion to the rate of change of monthly expenditure, stock value per building is estimated to be 5.14×10^6 Rp., 7.47×10^6 Rp. and 10.84×10^6 Rp. in 2020, 2040 and 2060 respectively.

(3) Manufacturing industry

Industrial properties are also estimated at stock value of properties per factory. The following procedures are taken to estimate stock value per factory.

Properties' value at present

(a) Manufacturing industries are classified into three sizes, namely, large/medium, small and household industry. Total number of manufacturing establishments in Indonesia was 1,538,786 in 1979.

(b) GRDP share of industrial sector (East Java) to GRDP share of the same sector (Indonesia) was about 19.2% in 1979.

(c) Total number of manufacturing establishments in East Java was estimated to be 295,695 in 1979 by using the above ratio, that is, $1,538,786 \times 0.192 = 295,695$.

(d) Assuming manufacturing establishments in East Java were increased at an annual growth rate of 2%, they would amount to 326,471 in 1984.

(e) GRDP of industrial sector (East Java) would be projected at $1,811 \times 10^9$ Rp. in 1984, assuming industrial sector constitutes about 16% of East Java's GRDP. In brief, gross regional domestic product per establishment in industrial sector is estimated to be 5.55×10^6 Rp.

(f) Since most of establishments are composed of small industry, labour cost in 1984 (Brantas basin) is projected to be 0.69 x 10^6 Rp./person. Based on the fact that average number of working people per establishment are estimated to be 7 persons, total labour cost would be 4.83 x 10^6 Rp. per establishment in 1984.

(g) Therefore, capital cost can be calculated as follows:

$$5.55 - 4.83 = 0.72 \times 10^6 \text{ Rp.}$$

Industrial properties vulnerable to inundation are classified into three objectives:

- Value of gross output is estimated to be equivalent to half of monthly gross output.

- Input cost is estimated to be equivalent to one month cost of material.

- Capital cost is estimated to be equivalent to ten years investment of equipment.

In case of small industry, the ratio of input cost to value added in Indonesia was 2.2 in 1979. In the same way, value of gross output/value added was 3.2. Using these ratios, value of industrial properties are estimated as follows:

- $5.5 \times 3.2 \times 1/24 = 0.74 \times 10^6$ Rp.

- $5.5 \times 2.2 \times 0.8 \times 1/12 = 0.81 \times 10^6$ Rp., on the basis of the fact that material cost constituted 80% of total input cost in 1979.

- $0.72 \times 10 = 7.2 \times 10^6$ Rp.

In conclusion, total value of properties per establishment in East Java is projected to be 8.75 x 10^6 Rp. in 1984.

Future increase of properties' value

(h) GRDP of industrial sector (East Java) is estimated to be 2,772 x 10^9 Rp., assuming that industrial sector constitutes 18% of East Java GRDP in 1990.

(i) Total number of establishments would amount to 356,977 on the assumption that they shall increase at a growth rate of 1.5% annually.

(j) GRDP per establishment would be 7.77×10^6 Rp. in 1990. Labour cost would increase up to 6.57×10^6 Rp., assuming that real wage will increase in proportion to the real growth rate of GRDP. Capital cost will be 1.20×10^6 Rp. eventually.

(k) The value of industrial properties would be estimated as follows:

It is assumed that the ratio of input cost to value added and of gross output to value added in 1990 is almost the same as that in 1979.

- Stock value

  $7.77 \times 3.2 \times 1/24 = 1.02 \times 10^6$ Rp.

- Material

  $7.77 \times 2.2 \times 0.8 \times 1/12 = 1.14 \times 10^6$ Rp.

- Equipment investment

  $1.20 \times 10 = 12.0 \times 10^6$ Rp.

(l) Total value of properties per establishment would be 14.16×10^6 Rp. in 1990.

(m) GRDP of industrial sector is estimated to be $5,143 \times 10^6$ Rp., assuming that the same sector constitutes 20% of GRDP in 2000.

(n) Total number of establishments amount to 414,286 on the assumption that they shall increase at a rate of 1.5% p.a. up to 2000.

(o) GRDP per establishment would be 12.4×10^6 Rp. in 2000. Labour cost would increase up to 10.96×10^6 Rp., assuming that real wage will increase in proportion to the real growth rate of GRDP. Capital cost will be 1.44×10^6 Rp.

(p) The ratios of input cost to value added and of gross output to value added in 2000 is also the same as those in 1979. Then, total value of properties per establishment is estimated to be 17.87×10^6 Rp. in 2000.

(q) The same procedures as what is mentioned so far are applied to estimate property value of industrial establishment in 2020, 2040 and 2060. Growth rate of GRDP after 2000 is shown in Table RC-20. Details of macro data are shown as below.

Year	GRDP of Industrial Sector	Labour Cost per Building	No. of Building	Capital Cost per Establishment
2020	13,524 x 10^9 Rp.	24 x 10^6 Rp.	505,507	2.75 x 10^6 Rp.
2040	29,150 x 10^9 Rp.	47 x 10^6 Rp.	558,532	5.20 x 10^6 Rp.
2060	62,464 x 10^9 Rp.	93.5 x 10^6 Rp.	617,119	7.70 x 10^6 Rp.

Equipment investment is assumed to be the major portion of industrial properties. Since equipment investment is on the basis of capital cost, industrial properties' value is assumed to increase in proportion to the increase rate of capital cost per factory. The value of industrial properties per establishment would be 34.1 x 10^6 Rp., 64.4 x 10^6 Rp. and 95.3 x 10^6 Rp. in 2020, 2040 and 2060.

(4) Commercial sector (financial, public service and private business)

Commercial sector is hard to estimate in terms of properties because business activities vary from one sector to another. For a convenience, two classifications are applied to commercial sector for the purpose of estimating value of properties per building. (A) category comprises public and financial services and does (B) private services.

Properties' value at present

(a) Financial sector

- The numbers of banks, insurances and estate (Indonesia) was 7,122, 80, and 1,077 in 1980 respectively.
- Total number of people in sectors (financial, real estate and business) were 302,345 (Indonesia) in 1980.
- If the average number of people is 20, total number of buildings in above sector would be 15,117.
- Assuming that the average number of people of above sector (financial, real estate and business) in East Java were 10 in 1980. The number of buildings would be 4,580 since total population of above sectors in East Java was 45,802 in 1980. (Statistic Indonesia 1983)
- The number of financial institutions was assumed to constitute about 47.6% of total buildings of above sectors (Indonesia) in 1980. Consequently, it was assumed that the number of financial buildings (East Java) would be 2,180 in 1980, using the ratio (47.6%).

(b) Public service

- The number of people engated in public service (East Java) was 1,494,661 in 1980. Assuming that the average number of people per building was 45, the number of building would be about 33,214.

(c) (A) Category (financial + public service)

- The number of buildings of (A) category was estimated to be 35,394 in 1980.

- Total number of people in (A) was estimated to amount to 1,516,461 which were composed of 2,180 x 10 (financial) and 1,494,661 (public service). The number of people per building was estimated to be 43 in 1980.

- Assuming that GRDP of (A) sector constitutes about 14% of GRDP in East Java in 1984, it would amount to 1,585 x 10^9 Rp.

- The number of buildings in (A) is estimated to increase at a rate of 1.0% p.a., which resulted in 36,831 in 1984.

- Total labour cost per building would be 0.965 x 10^6 x 43 Rp., assuming that annual income and the number of people per building are estimated to be 0.965 x 10^6 Rp. and 43 persons respectively.

(d) (B) Category (private business)

- Total number of buildings (financial, real estate and business) was already projected to be about 15,117 (Indonesia) in 1980. The number of buildings for private business was estimated to be 6,838 which shared 45% of total buildings relating financial, real estate and private business.

- The number of buildings for private business would be 4,580 x 0.45 (2,061) in East Java since the number of buildings (financial, real estate and business) was already estimated to be 4,580 in 1980.

- GRDP of private business is estimated to be 226 x 10^9 Rp. in 1984, assuming that it constitutes about 2% of GRDP in East Java.

- Total labour cost per building is estimated to be 1.3 x 10^6 x 50 Rp., assuming that annual income and number of people per building is 1.3 x 10^6 Rp. and 50 persons respectively.

- The number of buildings are estimated to be 2,102 in 1984 at 0.5% rate of increase p.a.

(e) (A) + (B) category

- Total labour cost of (A) + (B) in 1984 can be expressed in the following:

  (A): $0.9 \times 10^6 \times 43 \times 36{,}831 = 1{,}425 \times 10^9$ Rp.

  (B): $1.3 \times 10^6 \times 50 \times 2{,}102 = 136 \times 10^9$ Rp.

- GRDP of (A) + (B) in 1984 is projected to be (1,585 + 226 = 1,811) $\times 10^9$ Rp.

- Capital cost is eventually calculated at 250×10^9 Rp. in 1984.

- Total number of buildings is 38,933 (2,102 + 36,831) in 1984.

- Subsequently capital per building is 6.4×10^6 Rp. in 1984.

- Assuming that value of properties is equvalent to 5 years capital cost, property value per building would be 32.0×10^6 Rp. in 1984.

Future increase of properties' value

(f) (A) + (B) category

- GRDP shared by commercial sector is projected to be $2{,}772 \times 10^9$ Rp., on the assumption that it constitutes 18% of GRDP in in East Java in 1990.

- Total labour cost of (A) + (B) in 1990 can be expressed in the following.

  (A): $1.22 \times 10^6 \times 43 \times 42{,}571 = 2{,}233 \times 10^9$ Rp.

  1.22×10^6 .... Sectors wage (0.9×10^6 Rp.) in 1984 will be multiplied by 1.359 on the basis of an annual growth rate 5.25% of GRDP of East Java up to 1990.

  43 ..... The number of people per building is assumed to be the same as that in 1984.

  42,571 ..... Total number of buildings based on an assumed annual growth rate of 1.5%.

(B): $1.77 \times 10^6 \times 50 \times 2,298 = 203 \times 10^9$ Rp.

1.77×10^6 .... Annual income (1.3×10^6 Rp.) in 1984 is increased on the basis of the real annual growth rate of GRDP.

50 ..... The number of people per building is assumed to be the same as that in 1984.

2,298 ..... The number of building in 1990 based on the rate of increase (1.5%) p.a.

- Capital cost is estimated to be 336×10^9 Rp. in 1990.
- Subsequently, capital cost per building would be 7.48×10^6 Rp. in 1990.
- Assuming that value of properties is equivalent to 5 year capital cost, property value per building is estimated to be 37.4×10^6 Rp.

(g) (A) + (B) category

- GRDP shared by commercial sector in East Java is projected to be $5,143 \times 10^9$ Rp., on the assumption that it constitutes 20% of GRDP in East Java in 2000.
- Total labour cost of (A) + (B) in 2000 can be expressed in the following.

(A): $2.03 \times 10^6 \times 43 \times 49,405 = 4,312 \times 10^9$ Rp.

2.03×10^6 .... Sector's wage which is 1.22×10^6 in 1990 will be multiplied by 1.66 on the basis of an annual growth rate 5.25% of GRDP in East Java up to 2000.

43 ..... The number of people per building is assumed to be the same as those in 1984.

49,405 ..... Total number of buildings based on an assumed growth rate of 1.5%.

(B): $2.95 \times 10^6 \times 50 \times 2,670 = 394 \times 10^9$ Rp.

2.95×10^6 .... Annual income 1.77×10^6 Rp. in 1990 is increased on the basis of the real growth rate of GRDP in East Java up to 2000.

50 ..... The number of people per building is assumed to be the same as that in 1984.

2,670 ..... The number of buildings in 2000 based on rate of increase 1.5% p.a.

- Capital cost is calculated at 437 x 10^9 Rp. in such a way that total labour cost is subtracted from GRDP in 2000.

- Subsequently, capital cost per building would be 8.4 x 10^6 Rp. in 2000.

- Assuming that value of properties is equivalent to 5 year capital cost, property value per building would be estimated at 42.0 x 10^6 Rp.

(h) Details of macro data are shown as below, for the purpose of estimating properties' value of commercial building after 2000.

Year	GRDP of Commercial Sector (10^9) Rp.	No. of Buildings	Total Labour Cost (10^9)	Capital Cost per Building	Property Value/ Building
2020	11,269	70,137	10,311	13.6 x 10^6 Rp.	68 x 10^6 Rp.
2040	22,423	94,464	20,556	19.7 x 10^6 Rp.	98 x 10^6 Rp.
2060	44,617	127,229	40,902	29 x 10^6 Rp.	145 x 10^6 Rp.

Properties' value per building is expressed at 1984 constant price.

The results of property (indoor movable) value per building are shown in Table RC-21.

5. Unit value of fish

Unit value of fish per ha was on the basis of data on the brackish pond area in East Java. These data are total value of fish, unit yield of fish, and the brackish fish pond area in 1977, 1980, and 1981. Assumptions were applied to estimate unit value of fish in 1984 in the following way.

- current value of fishes is assumed to grow in proportion to the annual growth rate of consumer price index for fishes between 1970 and 1980.

- the area of the brackish fish pond in 1984 is assumed to be the same as that in 1981.

The projected current value of fishes and unit value of fishes are 32,945 x 10^6 Rp. and 0.84 x 10^6 Rp./ha respectively in 1984, which is shown in Table RC-22.

Since there would be the difficulty of assessing future value of fishes as well as the area of brackish fish pond up to 2000 in East Java, the following assumptions were applied to estimate unit value of fishes at 1984 constant price.

- unit yield of fishes is assumed to grow in proportion to the annual growth rate of that between 1977 and 1981.

- unit value of fishes per ha in 2000 is assumed to be the same as that in 1984.

Therefore, unit value of fishes is assumed to increase based on the annual growth rate of unit yield.

After 2000, projection of unit value of fishes per ha is based on the diminishing growth rate which is estimated at 90% of the annual growth rate of unit value of fishes during previous decades.

6. Unit cost of fish pond facility

With respect to fish pond facility, dyke which is a part of facility is taken up as damageable facility. The value of dyke per ha was estimated at around 130×10^3 Rp. in 1984 due to the study team's survey. The following assumptions were applied to estimate future value of fish pond facility at 1984 constant price.

- Current value of facility per ha is assumed to increase at 17% based on the increase rate of private consumption of construction material during 1970 - 1980.

- Deflator is Consumer Price Index based on the increase rate of CPI between 1970 and 1983.

- Projection of facility value after 2000 is based on diminishing rate of increase which is estimated at 90% of the increase rate of facility value (constant price) during previous decades.

Results of them are shown in Table RC-23.

7. Infrastructure Damage

Infrastructure in inundated area (Brantas basin) is represented by railway, flood dyke, roads and irrigation facilities. A rough assumption is made that damage related to infrastructure would be 30% of crop and building damage, although insufficient data make it difficult to obtain the above ratio. The assumed rate 30% is rather conservative. In Malaysia, this rate varies 30% to 50%.

8. Indirect Damage

Damages under this category involve commercial trade loss, transportation loss brought by interruption of economic activities and so on. Indirect damage is estimated at 10% of the total of direct damages. This percentage ranges from 5% to 10%. If poor drainage system makes flood damage bigger, indirect damage would be larger than expected. The assumed rate 10% is therefore not an underestimated figure.

NOTE RC-2 LIST OF DATA

Number	Name of Data	Author	Date of Issue
RC 01	Report on Brantas River Development Plan : Main Report : Supporting Report	O.T.C.A. (Now JICA)	May 1973
RC 02	Design Report on Kali Porong River : Main Report : Drawing	Nippon Koei Co., Ltd.	Oct. 1976
RC 03	Feasibility Report on Brantas Middle Reaches River Improvement Project	DGWRD	Jun. 1977
RC 04	Design Report on Brantas Middle Reach River Improvement : Stage I : Stage II	Nippon Koei Co., Ltd. and in association with CTI Engineering Co., Ltd.	Jan. 1979
RC 05	Feasibility Report on the Tulungagung Drainage Project: Vol. I : Main Report Vol. II : Economic Indication Study on Socio-Economic and Local Environment Vol. III: Hydrological Study Vol. IV : Civil Engineering Study and Irrigation Study Vol. V : Drawings	Nippon Koei Co., Ltd.	Dec. 1979

Number	Name of Data	Author	Date of Issue
RC 06	Preliminary Study on the Widas Basin Flood Control and Drainage Project	DGWRD	Apr. 1979
RC 07	Result of Reconnaissance for Widas River Basin	DGWRD	Jul. 1980
RC 08	Comprehensive Study Report on the Widas Basin Flood Control and Drainage Project : Main Report	DGWRD	Dec. 1980
RC 09	Summary of Comprehensive Study Report on the Widas Basin Flood Control and Drainage Project	DGWRD	Mar. 1981
RC 10	Warujayeng - Turi Tunggorono Irrigation Project Feasibility Study : Vol. 3 : Annexe A Meterology and Hydrology : Annexe B Flood Protection	Binnie and Partners in Association with Hunting Technical Services Ltd. and Sir M Mardonald and Partners	Aug. 1981
RC 11	Design Report PART I : Hydraulic Structure for the Kali Surabaya River Improvement Project Design Report PART II : River improvement Works for the Kali Surabaya River Improvement Project	N I K K E N CONSULTANT CO., INC., in association with Nippon Koei Co., Ltd. and Tokyo Construction Consultant Co., Ltd.	Aug. 1976

Number	Name of Data	Author	Date of Issue
	Survey and Study Report for the Kali Surabaya River Improvement Project		
RC 12	Feasibility Study Report on Extention of Kali Surabaya River Improvement Project : Drainage Improvement of Western Urban Area and Kedurus River Basin	N I K K E N CONSULTANT INC.	Jun. 1979
RC 13	Proyek Induk Pengembangan Wilayah Sungai Kali Brantas	DGWRD	" 1983
RC 14	The Brantas River Development Project	DGWRD	" 1984
RC 15	Survey Investigation K. Nambaan, K. Konto dan Afvoer Besuk 1982 - 1983 - Final Report buku I - Laporan Utama	Jurusan Tehnik Sipil Fakultas Tehnik Universitas Gajah Ma da, Yogjakarta	

Number	Name of Data	Author	Date of Issue
RC 50	River cross section	DGWRD	
	- Porong River : Surveyed in 1977		
	- Brantas River: 47-80 Dec. 82-Jan.'83		
	: 81-99 Sep.82-Feb.'83		
	: 100-139 Jan-Mar.'83		
	- Widas River : Surveyed in 1984		
	- Parit Agung : Surveyed in 1978		
RC 51	River Plan	DGWRD	
	- Porong River		
	- Brantas River		
	- Parit Agung		
	- Parit Raya		
	- Widas River		
RC 52	Topo map	DGWRD	
	- Widas Retarding Basin s=1/5000		
	- Upper Widas River s=1/10.000		
	- Tributaries of Widas Basin (Ulo, Kuncir and Kedungsoko) s=1/5000		
RC 53	River Bed Elevation	P.U. East Java	
	- Porong 1971 - 78		
	- Ngrawe 1971 - 79		
	- Terusan 1971 - 83		
	- Gempolkerep 1971 - 83		
	- Kesamben 1971 - 83		
	- Tapen 1971 - 83		
	- Ploso 1978 - 83		
	- Bunder 1971 - 83		
	- T u r i 1971 - 83		
	- Kertosono 1971 - 83		
	- Purwasari 1971 - 82		

Number	Name of Data		Author	Date of Issue
	- Papar	1971 - 83		
	- Minggiran	1978 - 82		
	- Jongbiru	1971 - 83		
	- Kediri	1971 - 83		
	- P a k e l	1973 - 75		
	- Nguri	1971 - 83		
	- Glondong	1971 - 83		
	- Ngambul	1973 - 75		
RC 54	Flood Inundation Data			
	- Inundation map of East Java		P.U. East Java	1975
	- Annual Inundation Area for each District		P.U. East Java	1984
RC 55	Investigation of Flood Damage due to 1984 Flood along Brantas River Basin		DGWRD	1984
RC 56	Inundation Area in Tulungagung in 1955 - 1971		DGWRD	-
RC 57	Data on Effect of Dredging, 1982 and 1983 in Brantas Middle Reach Construction		DGWRD Kediri Office	1984

NOTE RC-3 SUMMARY OF PROJECT

NAME OF PROJECT : BRANTAS MIDDLE REACH RIVER IMPROVEMENT PROJECT
REF. : RC - 04 (Stage II)

1. Background

Investigation and planning to control the flood in the Brantas River and also to utilize effectively its water resource were carried out in 1961 and the overall development program of the Brantas River Basin was initially formulated. Along with this formulated program, many flood control works are achieved up to now and some are ongoing, for purpose of flood mitigation and other basin development.

The above program was updated in 1972 under the technical assistance of Japan, and Middle Reaches River Improvement Project was initially worked out. Following to this planning, feasibility study on this Project was carried out by the Brantas River Basin Development Executive Office. In parallel with this feasibility study, urgent work to rehabilitate the critical part of levee along the Brantas River was started mainly in the middle river stretch in 1976.

In September 1977, loan agreement to proceed with the detailed design of the Project was concluded between the Government of Indonesia and Overseas Economic Cooperation Fund (DECF). The detailed design works of stage I Project was finalized on January 1979, and the stage II on January 1980, respectively. The stepwise implement was proposed by separating into the above 2 stages of stage I to construct river channel for 10-yr probable flood and stage II for 50-yr probable flood.

The stage I has been almost completed as of October 1984 and the stage II is subsequently commenced in 1985.

2. Objectives of the Project

- relieving the riparian area along the middle stretch of the Brantas from menace against overtopping of flood by increasing the discharge capacity of the river channel.

- Working out a stable river channel against sedimentation especially brought from lahar area ar-und Mt. Kelud,

- Mitigating the habitual back swamp area due to insufficient drainage by dredging the river bed of the Brantas

- Protecting the existing deteriorated levees by constructing the revetments and groynes, and

- Modifying the existing irrigation intakes, pumps and bridges related to the river improvement.

3. Project Features

3.1 Project Area

- Brantas Middle Reach River (47 km - 140 km)

3.2 Project Component

- The Project (Stage I and Stage II) consists mainly of dredging and excavation works, and its component is given below.

Works	Quantity
- Dredging volume	15,852,000 m^3
- Excavation of high water channel	1,200,000 "
- Embankment of retaining structure for spoil bank	1,244,000 "
- Levee embankment	1,216,000 "
- Revetment	
Wet masonry	464,600 m^2
Gabion mattress	293,800 "
Gabion cylinder	10,600 m^3
Groyne	20,900 "
- Compensation	
Land	1,293 ha
House	455 nos

3.3 Construction Cost (1979 cost, ¥ 220 = Rp. 625 = US$ 1)

- Economic cost (US$ 10^6)

Item	Cost
Total	101.817
F/C	33.737
L/C	68.08

- Financial cost

Item	Cost
Total	Rp.109,383 x 10^6
F/C	¥ 12,770 x 10^6
L/C	Rp. 73,105 x 10^6

- Breakdown of Financial Cost

Item	Foreign C. (¥10^3)	Local C. (Rp.10^3)
- Preparatory work	-	428,422
- Survey and investigation	-	319,512
- Main works	-	25,041,798
- Modification	5,437	580,966
- Compensation	-	10,538,584
- Teremeter and tel. system Equipment and s/p	7,836,596	37,452,488
- Contingency : Physical	1,309,442	5,246,116
Price	1,845,962	28,127,472
- Engineering	1,777,580	406,300
- Administration	-	1,872,624
- Grand total	12,769,580	73,105,000
- O/M cost	1% of the above total cost	

- Annual Disbursement

Item	Total	1978/79	79/80	80/81	81/82	82/83
F/C (¥10^3)	12,769,580	-	-	3,085,962	2,113,038	134,000
L/C (Rp.10^3)	73,105,000	350,000	1,220,000	1,875,000	4,125,000	6,316,000

Item	1983/84	84.85	85/86	86/87	87/88	88/89
F/C (¥10^3)	143,000	242,000	2,569,000	1,413,000	2,892,000	175,000
L/C (Rp.10^3)	6,835,000	6,729,000	7,728,000	10,775,000	9,993,000	9,911,000

Item	89/90	Sub total for stage II
F/C (¥10^3)	184,580	7,051,580
L/C (Rp.10^3)	7,248,000	45,655,000

3.4 Benefit (US$ 10^3)

- Annual Flood Benefit

Stage	Benefit
I (10-yr)	4,194
II (50-yr)	9,460

3.5 Economic Evaluation

- EIRR (%)

Stage	EIRR
I	7.6
II	8.0

3.6 Implementation Schedule

- Total period : II years including detailed design stage for 2 years
- Commencement : Feb. 1978/79
- Construction Period : 6 years for stage I
  : 5 years for stage II

3.7 Others

- The design discharge distribution and typical cross sections are presented in ANNEX RC -.

NAME OF PROJECT : TULUNGAGUNG DRAINAGE PROJECT
REF. : RC - 05

1. Background

The Tulungagung town and Tulungegung area had been suffering from inundation since the beginning of their history. Owing to the effects of past works, the inundation condition has been improved to great extent. Yet, there still remains inundation though smaller in area and shorter in duration than the past.

On the occasion of the appraisal for the Lodoyo Irrigation Project which has a direct influence to the drainage condition of the Tulungagung area, this project was brought into being at the request of DGWRD to ADB.

The study on overall plan was started in Oct. 1978 and its feasibility study for 1st priority project ended in Dec. 1979.

Following the study mentioned above, detailed design was carried out and construction works for phase 1 and phase 2 are ongoing by the following 2 methods of force accounting and contract systems.

2. Objectives of the Project

- To eliminate damages due to flooding in the Ngrowo basin
- To develope water resources, irrigation in the Ngrowo basin

3. Project Features

3.1 Project Area

- Ngrowo river basin
- Tulungagung town and its surrounding lowlying areas

3.2 Project Component

- Flood control and storage facilities

  Wonorejo dam
  Segawa weir
  Connection tunnel
  Kampak dam
  Bagong dam
  Tugu dam

- Drainage Facility

  New Parit Agung Canal
  New Tulungagung Gate
  Urban Drainage System
  New Tulungagung Tunnel
  Improvement of Existing Rivers
    (Parit Raya, K. Song, K, Gondang, K. Ngasinan and Ngasinan Kanan Canal)

For the above, component-wise phasing was determined as follows, based on the priority.

Phase	Component
1	Parit Agung canal, Besuki tunnel and related structures,
2	Segawa weir, Wonorejo dam, connection tunnel and West Tulungagung, Lower K. Dawir and Tlogoburat irrigation schemes
3	Enlargement of Parit Raya canal and other major rivers, Kampak dam and Tawing irrigation scheme
4	Bagong dam, Tugu dam ; and Trenggalek and Ngasinan Irrigation schemes

3.3 Construction Cost and Benefit

- Economic cost, benefit and EIRR for overall plan

Phase	Economic cost (US$10^6)	Annual benefit (US$10^6)	EIRR (%)
1	37.9	6.8	13.0
2	35.2	7.8	16.1
3	52.9	4.3	6.4
4	52.9	4.3	6.4

- Breakdown of Financial cost for Phase 1 Project (US$10^6)

Item	Foreign C.	Local C.	Total
Civil works	7.626	13.48	21.106
Equipment and s/p	8.586	0.326	8.812
Engineering	3.105	0.345	3.450
Land aquisition	-	2.441	2.441
Administration	-	2.832	2.832
Physical conteingency	3.604	2.917	6.521
Price contingency	6.679	13.731	15.326
Total	36.000	31.000	67.000

- Annual Disbursement for Phase 1 Project (US$10^3)

Portion	1980	1981	1982	1983	1984	1985	Total
F/C	6035	6929	6789	4077	4226	2685	30,741
L/C	2570	7592	8240	6647	6619	4596	36,259
T	8605	14521	15029	10719	10845	7281	67,000

- Quantity of Benefit for Phase 1 Project

		Benefited Area (ha)			
			Irrigation		
Phase	Scope *1	Drainage	Wet Season	Dry Season	Dry/Wet (%)
Phase 1	D	3,910	-	-	-
Phase 2	WFI	-	6,700	6,400	96
Phase 3	WFID	-	3,600	3,600	100
Phase 4	WFI	-	4,700	3,100	66
Overall	WFID	3,910	15,000	13,100	87

*1 W : Water resource, F : Flood control,
I : Irrigation , D : Drainage

3.6 Implementation schedule for each Phase

Phase	1982/83	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91
1	----------								
2	------	----------							
3	----------		----------						
4			----------			----------			

Remark ---------- Preparatory work
_____ Construction works

4. Water Balance

- Water requirement : 80% dependability

Wonorejo dam	36.4 x 10^6 m^3
Kampak	18.9 x 10^6 m^3
Bagong	9.3 x 10^6 m^3
Tugu	8.9 x 10^6 m^3
Total	73.5 x 10^6 m^3

- Anuula average available water (1954 to 1977)

(m^3/s)

Mean	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
33.7	52.5	62.2	57.4	51.7	35.3	25.0	19.5	15.4	8.4	14.2	24.6	37.5

4.3 Water Balance

- The max. water requirement is estimated below.

Overall Water Balance
Wet Season Paddy : 20,000 ha
Water Source Area : 620 km^2

(10^6 m^3)

Year	Dry season paddy area in ha					
	3,000	6,000	9,000	12,000	15,000	18,000
1954						
1955						
1956						
1957		0.2	9.4	19.1	43.2	52.5
1958						
1959						
1960					1.2	4.0
1961		1.7	7.0	18.0	35.5	53.3
1962						
1963			11.6 *1	27.3 *1	43.8) C.O*2	61.0
1964	8.7 *1	8.7 *1	8.7 *1	8.7 *1	21	
1965		5.0	20.6	46.7	73.9	101.0
1966			5.3	16.9	33.3	50.2
1967		8.4	24.8	42.9	71.1	99.3
1968						
1969			14.2	29.9	46.3	63.3
1970			C.O*2	C.O*2	C.O*2	
1971	2.8	8.9	12.7	124.5)	187.0)	249.6
1972	59.0	59.9	84.0)			
1973					0.6	2.2
1974			3.3	8.4	14.9	29.2
1975				7.4	13.3	20.2
1976		4.6	20.4	48.0	76.2	104.5
1977					9.8	32.0

Note : *1 wet season peak *2 carry over

5. Recommendation

- With the progress of the project works and the future works, it will be essential to review the planning and implementation schedule.

NAME OF PROJECT : WIDAS FLOOR CONTROL AND DRAINAGE PROJECT
REF : RC 06 to RC 09

1. BACKGROUND

A historical flood occured in Jan. 1979 in the Widas basin, and brought about a destructive damage of houses, paddy fields, public facilities and so on into the basin, especially each in and around of Nganjuk and Lengkong.

From such situation mentioned above, a preliminary study on Flood Control and Drainage Project was carried out in 1979 by BRBDEO. Subsequently, comprehensive study was conducted by BRBDEO to formulate a provisional flood control and drainage plan in the K. Widas basin, including studies on water availability and possible dam sites for flood control, irrigation supply, hydropower generation and so on.

At present, by receiving the background mentioned above, a Master plan study on the K. Brantas Basin Development including the K. Widas basin has been conducted by JICA, Japan, by reviewing the Brantas River Development Plan prepared in 1973 by OJCA, Japan (now JICA). Subsequently, a feasibility study on the Widas Flood Control and Drainage will be conducted in the coming fiscal year, based on the above mentioned Master Plan Scheme. In addition, another Project related to the above, has been conducted by BRBDEO. Although it is a partial river improvement of the lower Widas and K. Kedungsoko to prevent the irrigation area from habitual inundation. Adjustment or cooperation between the both Projects is strongly required hereafter.

2. Objectives of the Project

- To develop irrigation area
- To protect from habitual inundation in the K. Widas basin against 10-yr probable flood.

3. Project Features

3.1 Project Area

- K. Widas basin
- Nganjuk, Lengkong and their surrounding areas

3.2 Project Component

- The Project consists mainly of :
  - River channel improvement
  - Construction of dam and
  - Construction of retarding basin

- The Project has been provisionally broken down into the following components

River channel improvement scheme

River name	Length
Widas Main River	43 km
- Widas Lower Reach	(21)
- Widas Upper Reach	(22)
Kedungsoko River	10
Kuncir River	16
Ulo River	15
Poh Buntu River	1.5
Tretes River	2
Ngrembek River	4
Pelangkengi River	5
Wotrangkul River	2
T o t a l	98.5 km

Construction of dam scheme

Description	Kuncir dam	Semantok dam	Kedungwarak dam
Location	DK. Klongean	Sambikerep	DK. Watugandul
Dam height	35 m	20 m	30 m
Dam length	300 m	300 m	250 m
Dam type	Earth dam	Earth dam	Rock fill dam
Effective res. cap	10×10^6 m^3	6×10^6 m^3	8×10^6 m^3
Catchment area	8.5 km^2	61 km^2	32.3 km^2
Feasible flood control discharge	100 m^3/s	50 m^3/s	50 m^3/s

Retarding basin scheme

Description	Retarding basin		
	Widas basin	Ulo basin	Kedungsoko basin
Retarding area			
1). Existing area	1,080 ha	1,340 ha	1,440 ha
2). After improvement	900	1,310	750
Water volume			
1). Existing W.V.	18×10^6 m^3	8.5×10^6 m^3	7.5×10^6 m^3
2). After improvement	12.5×10^6 m^3	6.5×10^6 m^3	4.0×10^6 m^3
Water level			
1). Existing W.L.	EL + 38.00 m	EL + 45.00 m	EL + 45.50 m
2). After improvement	EL + 37.60 m	EL + 44.80 m	EL + 45.00 m
Mean water depth	1.67 m	0.63 m	0.52 m

- For the above overall plan, the following four alternative plans have been provisionally studied to formulate a priority project.

Alternative	River improvement	Dam	Retarding basin
	- Widas main river	- Kuncir	- Widas retarding basin
I	- Kedungsoko river - Ulo river and - Main tributaries	- Semantok - Kedungwarak	
II	- do -	- do -	
	- Widas lower reach		
III	- Kedungsoko river - Ulo river	- do -	
IV	- do -	- Kuncir - Kedungwarak	

3.3 Construction cost and Benefit (Rp.625 = US$1)

- Construction cost

(unit : US$ x 10^6)

Alternative	Cost	R/C	L/C	Total
I	Economic Cost	105.9	94.2	200.1
	Financial Cost	166.3	182.3	348.6
II	Economic Cost	89.8	30.0	119.8
	Financial Cost	140.4	56.2	196.6
III	Economic Cost	72.8	24.3	97.1
	Financial Cost	108.9	42.6	151.5
IV	Economic Cost	65.9	21.9	87.8
	Financial Cost	96.8	37.2	134.0

- Benefit

(unit : US$ x 10^6)

Alternative	Annual net return *1
I	24.311
II	15.065
III	14.84
IV	14.84

Note *1 1993 to 2040

3.4 Economic evaluation (1981 cost)

- The results are as follows.
  The most highest B/C ratio : Alternative IV

$$B/C = \frac{\text{US\$ } 64,438,627}{\text{US\$ } 59,172,576} = 1.09 \text{ (at discount rate of 10\%)}$$

B - C = US$ 5,266,051

3.5 Implementation schedule

	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92
1. Kuncir Dam									
2. Kedungwarak Dam									
3. Semantok Dam									
4. River Improvement									
5. Retarding Basin									

4. Recommendation

The study clarifies that the Widas basin flood control and drainage project is needed for protection and promotion of the public welfare and agricultural products in relation to the land and water resources development in the Project area. Teh Project is technically sound and economically feasible. It is therefore recommended that the project is implemented as soon as possible.

Since this study aims the formulation and justification of the plans at a level of preliminary feasibility study, further studies are required before the execution of construction works.
The studies may include new survey in topography, geology and appurtenant facilities related to the project.

: Surabaya River Improvement Project Stage II

Ref. : RC - 12

1. Background

Surabaya is a prominent commercial and industrial city of social and economic importance in Indonesia. The city has a population of 1,970,000 (as of 1983) in an area of 274 km^2 consisting of 16 sub-districts and is the capital city of East Jawa Province and the second largest town in Indonesia.

Surabaya city and its hinterland have been suffering from flood disasters such as flooding of the Surabaya, Marmoyo and Mas rivers and habitual inundations caused by local heavy rainfall. In order to prevent these disasters, a study was performed in 1973 by the then OTCA, Japan at the request of GOI. In the OTCA Report, a master plan was recommended and an improvement plan (Surabaya river improvement Project) was formulated as the 1st stage project for solving the principal part of the problems.

The Surabaya River Improvement Project was implemented by BRBDEO (DGWRD) with a loan from OECF during the period from 1975 to 1980. The project provided the Surabaya city with the flood control facilities and sea dikes against 50 yr storm. The project also improved the Mas river, Morokrembangan Boezem, and sea dike gates as the 1st stage improvement of the urban drainage systems.

In 1979, during the period of execution of the above project, BRBDEO formulated the 2nd Stage Plan for the Surabaya River Improvement Project within the frameworks of the master plan in the OTCA Report. The proposed 2nd Stage Plan covered the improvement of four drainage systems related to the said 1st stage improvement such as Mas river system, Morokrembangan Boezem system, Gunungsari canal system, and Kedurus river system.

On the other hand, detailed design for Surabaya Drainage Improvement was commenced in 1980 by DGCK as a component of Urban-III project assisted by IBRD loan. The urban-III project will be completed within 1984 and subsequently, Urban-V project is scheduled to start from 1984. These projects cover the improvement of major pumping stations and channels in the Mas river and Morokrembangan Boezem system proposed by the 2nd Stage Plan for the Surabaya River Improvement Project.

Among the sub-project proposed by 2nd Stage Plan, improvements of Gunungsari canal, Kedurus river, Wonokromo sluice, and Gubeng dam are left as they are, waiting for the immediate execution by DGWRD.

Under the above-mentioned circumstances, BRBDEO with coordination of DGWRD, formulated the Surabaya River Improvement Project Stage II, revising the above 2nd Stage Plan, with some complementary studies, in consideration of Surabaya Drainage Improvement (Urban-III and V projects) by DGCK. The project area for the Stage II is given in Fig. 29.

2. Objectives of the Project

Objective of the Project is to protect the Surabaya urban area and its hinterland from habitual inundation.

3. Project Features

3.1 Project Area

- Gunungsari canal basin : 13.7 km^2
- K. Kedurus basin : 67.4 km^2
- Other related area : 15.6 km^2

Total : 96.7 km^2

3.2 Component of the Project

The project is divided into three packages.

- Package-I : Improvement of Gunungsari drainage canal, l = 6.7 km
  : Realignment of irrigation canal, l = 6.7 km
  : Repair of Wonokromo sluice and Gubeng dam
- Package-II : Construction of Gunungsari diversion channel, l = 6.1 km
- Package-III : Improvement of Kedurus river, l = 5 km

3.3 Quantity of major works

- Excavation : 818,000 m^3
- Dredging : 172,000 m^3
- Embankment : 171,000 m^3
- Transportation and disposal : 669,000 m^3
- Revetment : 36,990 m^2
- Road bridge : 31 Units
- Footpath Bridge : 27 Units

3.4 Implementation time : 6 years

3.5 Construction cost (1984 price, US$ 1 = Rp. 1,000)

- Total Cost : US$ 57,765,000
- Local cost : US$ 14,731,000
- Foreign exchange cost : US$ 43,034,000