REPUBLIC OF INDONESIA
MINISTRY OF PUBLIC WORKS AND ELECTRIC POWER
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT

FEASIBILITY REPORT ON THE WONOGIRI IRRIGATION AND UPPER SALA RIVER IMPROVEMENT PROJECT

APPENDIX Ⅳ DATA

JAPAN INTERNATIONAL COOPERATION AGENCY

TOKYO 1976

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Data- 1.1 Mean Monthly Temperature Records

Station : Panasan Airport (Unit : ^{o}c)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1964	28.7	28.6	27.9	27.9	27.6	27.2	27.4	27.7	28.9	27.9	27.3	28.3	27.9
1965	26.3	27.4	27.1	28.1	28.5	28.3	27.5	27.6	29.2	30.9	30.0	28.9	28.3
1966	27.7	27.7	27.8	28.7	28.7	27.7	27.6	28.6	29.6	29.2	28.6	28.0	28.3
1967	27.0	27.4	27.8	28.5	29.4	27.6	26.7	27.7	28.6	30.3	29.8	27.8	28.2
1968	26.7	26.9	28.0	28.1	27.5	27.6	27.2	27.3	28.5	29.1	28.8	27.6	27.8
1969	28.2	27.6	28.9	29.1	29.8	29.4	29.3	29.1	30.0	31.0	29.7	29.0	29.2
1970	28.3	27.4	28.7	28.2	28.7	29.0	28.4	28.5	29.2	29.2	28.6	27.1	28.4
1971	26.8	26.5	26.7	28.4	27.1	27.5	27.0	27.6	28.9	29.1	27.3	27.9	27.
1972	26.3	27.2	27.4	27.9	28.9	27.8	27.1	-	-	-	-	-	-
Mean	27.3	27.4	27.8	28.3	28.5	28.0	27.5	28.0	29.1	29.6	28.8	28.1	28.2

Data-1.2 Mean Monthly Relative Humidity Records

Station : Panasan Airport (Unit : %)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1964	72.0	73.0	76.0	75.0	72.0	71.0	66.0	63.0	63.0	72.0	72.0	71.0	70.5
1965	80.0	77.0	80.0	70.0	64.0	64.0	60.0	54.0	53.0	52.0	63.0	72.0	65.0
1966	77.0	77.0	77.0	73.0	70.0	68.0	60.0	58.0	62.0	64.0	71.0	77.0	69.5
1967	80.0	77.0	73.0	71.0	57.0	59.0	59.0	61.0	56.0	55.0	65.0	74.0	65.6
1968	81.0	80.0	77.0	77.0	78.0	76.0	74.0	69.0	65.0	64.0	71.0	77.0	74.1
1969	73.0	77.0	71.0	67.0	64.0	61.0	56.0	56.0	55.0	54.0	73.0	70.0	64.8
1970	74.0	75.0	74.0	75.0	74.0	65.0	59.0	50.0	60.0	55.0	76.0	77.0	67.8
1971	73.0	81.0	78.0	70.0	75.0	72.0	68.0	64.0	62.0	70.0	73.0	74.0	71.7
1972	73.0	75.0	82.0	70.0	71.0	63.0	62.0	-	-	-	-	-	70.9
Mean	75.8	76.9	76.4	72.0	69.4	66.6	62.7	59.4	59.5	60.8	70.5	74.0	69.0

Data - 1.3

Mean Monthly Sunshine Hour Records

Station : Panasan Airport

(Unit : ^{o}c)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1964	30	30	30	30	40	60	70	50	70	30	40	40	43.3
1965	20	20	30	50	60	60	80	90	90	90	60	60	60.0
1966	50	30	30	50	60	50	90	70	70	40	40	30	50.8
1967	20	30	50	70	90	90	90	90	90	60	50	30	60.0
1968	20	30	40	40	30	40	40	50	70	50	50	30	40.8
1969	40	50	50	50	50	70	80	80	80	50	40	30	50.8
1970	30	30	30	40	40	60	60	70	50	50	30	10	40.8
1971	30	40	40	60	50	50	80	80	50	30	30	30	69.2
1972	30	30	30	50	50	90	-	-	-	-	-	-	46.7
Mean	30.4	31.1	36.6	45.6	51.1	63.3	70.0	72.5	75.0	52.5	48.8	33.8	49.7

Data- 1.4 Mean Monthly Wind Records

Station : Panasan Unit : Wind direction (Km/hr)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1964	SW40(4)	NE40(2)	NE40(4)	NE40(3)	NE40(4)	S (4)	S (6)	SW40(6)	SW40(6)	SW40(7)	SW40(10)	SW40(5)	5.1
1965	NE40(6)	S (5)	SW40(3)	N (3)	SW (4)	SW40(5)	SW40(5)	SW40(9)	SW40(11)	SW40(10)	SW40(7)	SW40(8)	6.3
1966	S (4)	NE40(3)	S (4)	NE40(5)	S (3)	S (3)	S (3)	SW40(11)	SW40(10)	S (5)	S (6)	S (6)	5.3
1967	S (4)	NE40(4)	N (5)	N (3)	S (5)	S (10)	S (9)	S (10)	S (10)	SW40(9)	S (6)	S (3)	6.5
1968	NE (4)	N (3)	N (3)	N (5)	SE50(5)	N (5)	S (4)	S (5)	S (6)	S (7)	S (5)	S (4)	4.7
1969	S (5)	NE40(4)	S (5)	N (4)	S (4)	S (6)	S (6)	S (8)	SW40(9)	S (6)	S (7)	S (7)	5.9
1970	S (8)	E (8)	S (8)	N (8)	N (10)	S (10)	S (10)	S (12)	S (12)	S (12)	S (10)	S (8)	9.7
1971	NE (8)	N (6)	S (8)	N (8)	N (8)	S (10)	SW (6)	S (6)	SW40(18)	S (12)	S (14)	S (10)	9.5
1972	S (4)	N (8)	N (12)	NE (6)	NE (8)	S (8)	S (10)	*	*	*	*	*	8.0
Mean	5.2	4.7	5.8	5.0	5.7	6.8	6.6	8.4	10.3	8.5	8.1	6.4	6.8

Data - 1.5 Mean Monthly Evaporation Records

Station : Madiun (Unit : mm)

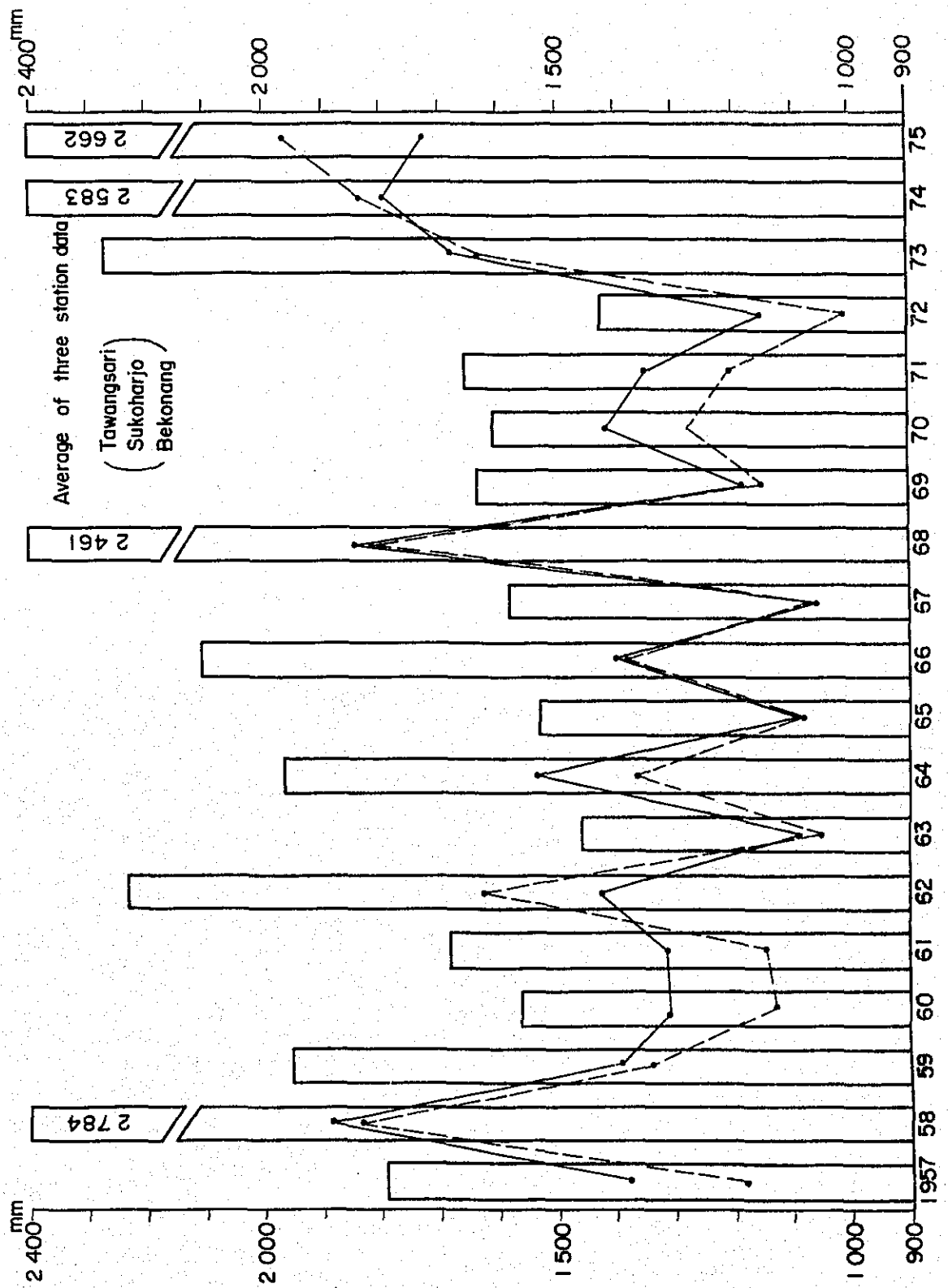
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1958	4.7	3.5	4.4	4.9	5.1	6.7	4.3	4.4	6.1	6.4	7.0	5.5	5.2
1959	3.5	4.7	3.7	4.5	4.4	4.1	4.4	5.6	5.0	6.3	4.9	3.2	4.5
1960	3.3	3.0	4.0	5.8	4.2	4.8	5.1	5.1	7.5	7.4	4.7	4.4	5.1
1961	4.2	4.1	3.9	5.8	4.2	4.8	5.1	5.1	7.5	7.4	4.7	4.4	5.1
1962	3.6	3.4	8.2	6.3	4.1	4.7	4.7	4.9	6.5	7.1	5.1	9.7	5.7
1963	5.8	4.1	4.0	4.3	8.5	4.9	3.1	5.8	7.3	7.8	7.0	9.6	6.0
1964	4.4	4.6	3.2	3.2	4.2	4.1	4.7	5.0	6.2	1.3	2.0	2.7	3.8
1965	3.9	5.6	5.6	4.1	4.6	5.0	5.1	6.1	7.5	7.6	6.1	5.0	5.5
1966	4.6	4.1	4.2	5.3	5.2	4.9	5.6	7.5	7.7	6.2	5.0	2.4	5.2
1967	2.7	3.7	4.5	4.5	5.4	6.9	6.4	7.1	7.3	11.3	5.1	3.6	5.6
1968	3.2	3.4	3.1	3.3	3.2	3.5	3.7	3.4	5.5	5.4	3.3	3.4	3.7
1969	4.5	4.2	5.0	4.9	5.5	4.9	4.9	5.8	7.5	6.7	5.1	5.2	5.3
1970	4.4	5.2	6.5	4.4	4.5	5.6	4.1	6.1	5.3	4.9	4.6	4.3	5.0
1971	4.1	5.0	4.0	5.0	6.0	5.0	5.0	6.0	7.0	7.0	4.1	4.1	5.2
Mean	4.1	4.2	4.5	4.6	4.9	4.9	4.7	5.6	6.7	6.6	4.8	4.8	5.0

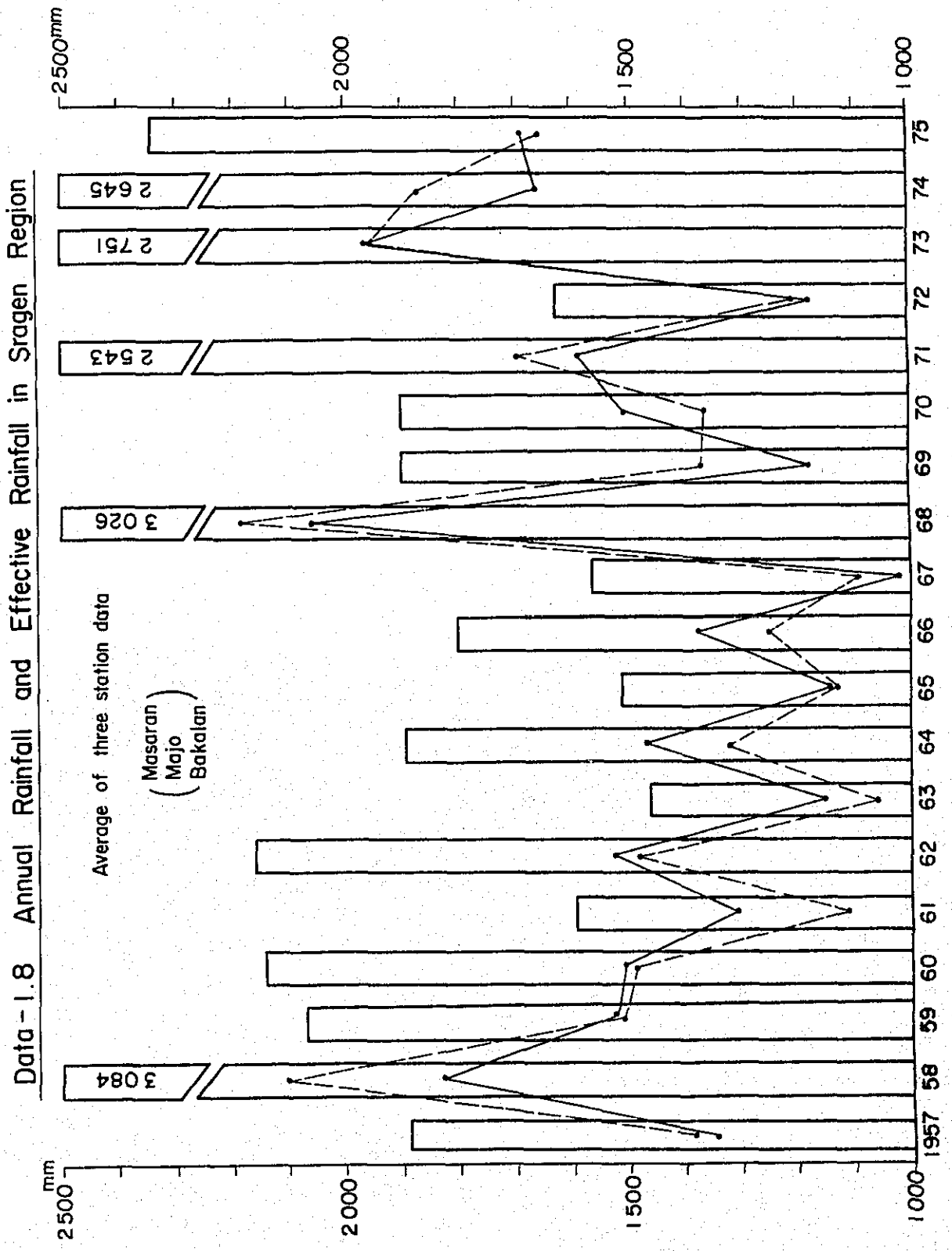
Data-1.6 Observation Records at Bengawan Sala Project Office in Surakarta

Class : Mounthly Mean

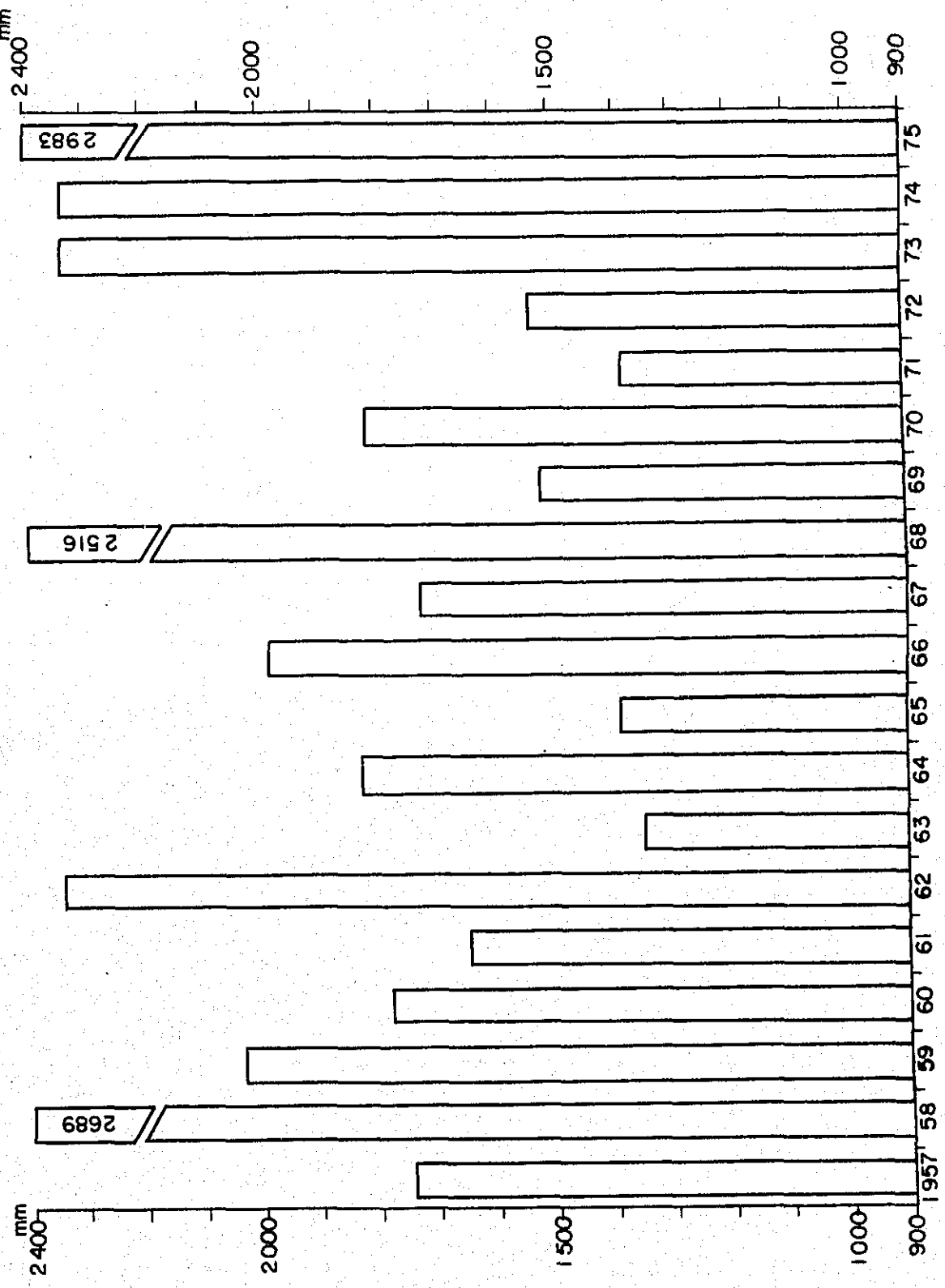
		1972				1973									Remarks
		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	
Temperature	(^{o}C)	27.9	29.7	30.1	28.0	27	28	28	28	27	27	27	28	27	At 8 O'clock
Max. Temperature	(^{o}C)	37	37.8	37	34	32.6	33.5	33	33.5	32	33	33	33.5	34.5	
Min. Temperature	(^{o}C)	14.5	16.5	22.	21	22.4	21.5	22	23	22.6	21	20	20.5	20.2	
Relative Humidity															
Max.	(%)	98.5	97.5	95.5	99.0	96	96	96	96	96	96	96	96	96	
Min.	(%)	19.5	24.0	35.0	46.0	54	57	55	51	54	50	50	43	38	
Evaporation	(mm/day)		5.6	3.2	1.6	0.9	1.1	1.2	1.5	1.3	2.3	4.0	4.2	5.0	

Data-I.7 Annual Rainfall and Effective Rainfall in Karanganyar Region




Data-I.8 Annual Rainfall and Effective Rainfall in Sragen Region
Average of three station data
(Masaran
Majo
Bakalan)
3 084
2 751
2 543
3 026
2 645
mm
2500
2000
1500
1000
1957
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75

Data-1.9 Annual Rainfall in Dengkeng Region (Tawangsari Rainfall station)



Data 1.10.1 Rainfall in Every Ten-Day Period

Station name: Tawangsari

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1956	1	*	*	*	*	0	45	0	21	8	26	22	39	
	2	*	*	*	*	30	15	183	38	16	51	52	108	
	3	*	*	*	*	115	91	74	141	0	10	135	28	
		*	*	*	*	145	151	257	200	24	87	209	175	-
1957	1	9	132	46	86	32	0	93	82	0	0	50	176	
	2	77	84	83	83	0	2	42	0	0	0	35	157	
	3	139	29	78	44	41	0	42	0	0	26	81	0	
		225	245	207	213	73	2	177	82	0	26	166	333	1749
1958	1	13	188	223	79	104	19	113	68	0	94	99	118	
	2	38	111	222	91	53	0	2	3	42	0	75	74	
	3	141	4	212	77	0	105	43	17	26	19	2	214	
		192	303	657	247	157	124	158	88	68	113	176	406	2689
1959	1	127	68	38	0	13	93	103	0	3	14	8	152	
	2	113	241	191	47	34	13	0	0	0	33	52	84	
	3	86	68	157	47	55	0	18	3	0	0	120	56	
		326	377	386	94	102	106	121	3	3	47	180	292	2037
1960	1	34	49	89	44	159	0	5	0	7	0	97	42	
	2	54	194	93	144	89	17	0	36	0	0	128	30	
	3	146	54	33	23	41	0	0	0	15	46	43	66	
		234	297	215	211	289	17	5	36	22	46	268	138	1778
1961	1	46	61	110	21	95	0	0	0	0	3	46	128	
	2	83	147	41	156	22	0	40	0	0	0	67	122	
	3	87	44	65	90	0	0	0	0	0	66	56	54	
		216	252	216	267	117	0	40	0	0	69	169	299	1650
1962	1	208	122	56	168	23	0	28	6	9	0	40	49	
	2	97	80	102	91	0	64	5	49	0	12	0	74	
	3	68	81	152	54	0	31	0	0	0	43	72	160	
		373	283	310	313	23	95	33	55	9	55	112	283	1944
1963	1	102	137	100	127	7	0	0	0	0	0	0	*	
	2	118	158	142	21	0	0	0	0	0	0	0	*	
	3	104	141	187	0	7	0	0	0	0	0	0	*	
		324	436	429	148	14	0	0	0	0	0	0	*	1351

Data 1.10.1 (continued-1)

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1964	1	0	180	114	95	41	45	7	0	0	122	107	47	
	2	0	62	60	147	13	17	0	7	15	74	6	224	
	3	0	45	98	35	90	0	0	2	50	72	0	53	
		0	287	272	277	144	62	7	9	65	268	113	324	1828
1965	1	107	19	70	112	8	0	0	0	0	0	0	73	
	2	59	71	138	0	37	0	27	0	0	0	115	15	
	3	53	140	18	0	62	6	0	0	0	0	223	37	
		219	230	226	112	107	6	27	0	0	0	338	125	1390
1966	1	107	87	140	6	0	22	0	0	4	94	24	154	
	2	44	133	295	28	9	0	0	0	0	98	125	38	
	3	78	195	60	100	9	0	0	0	0	15	95	33	
		229	415	495	134	18	22	0	0	4	207	244	225	1993
1967	1	107	78	239	121	0	0	0	0	0	20	133	213	
	2	59	191	14	10	17	0	0	0	0	0	24	73	
	3	53	65	38	14	0	0	0	0	0	19	87	152	
		219	334	291	145	17	0	0	0	0	39	244	438	1727
1968	1	201	95	145	67	40	68	22	3	16	43	89	56	
	2	33	27	94	21	130	105	25	18	27	21	209	65	
	3	102	67	309	73	55	23	7	89	79	69	23	0	
		336	189	548	161	225	196	54	110	122	133	321	121	2516
1969	1	40	25	0	103	0	7	0	0	0	0	66	86	
	2	15	171	51	116	0	0	0	0	0	0	48	92	
	3	114	64	131	105	10	0	0	0	0	126	55	97	
		169	260	182	324	10	7	0	0	0	126	169	275	1522
1970	1	66	60	59	154	116	0	0	0	4	0	64	136	
	2	104	109	146	39	101	54	0	0	22	0	105	65	
	3	48	47	60	59	0	0	0	0	6	47	78	69	
		218	216	265	252	217	54	0	0	32	47	247	270	1818
1971	1	65	113	91	18	20	0	16	0	0	0	45	93	
	2	67	83	176	59	69	0	0	0	0	77	0	78	
	3	71	55	175	0	0	5	0	0	0	59	0	15	
		197	251	382	77	89	5	16	0	0	136	48	186	1384

Data 1.10.1 (continued-2)

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1972	1	91	35	162	32	128	0	0	0	0	0	0	54	
	2	88	49	64	70	145	0	0	0	0	0	50	183	
	3	34	38	92	56	64	0	0	0	0	0	82	23	
		213	122	318	158	337	0	0	0	0	0	132	260	1540
1973	1	180	87	93	20	99	15	5	0	0	0	0	49	
	2	183	113	151	5	215	25	0	0	22	0	0	128	
	3	98	185	160	79	130	10	0	0	54	88	94	51	
		461	385	404	104	444	50	5	0	76	88	94	228	2339
1974	1	162	159	164	186	112	0	0	5	64	75	6	67	
	2	57	136	102	35	75	0	0	17	74	0	198	51	
	3	62	158	80	9	0	9	28	80	0	93	76	0	
		281	453	346	230	187	9	28	102	138	168	280	118	2340
1975	1	157	122	176	83	6	0	0	0	23	215	17	144	
	2	82	129	91	152	169	0	26	24	246	50	138	97	
	3	149	65	216	60	12	3	0	0	40	173	34	84	
		388	316	483	295	187	3	26	24	309	438	189	325	2983

Data 1.10.2 Rainfall in Every Ten-day Period

Station name: Sukoharjo

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1956	1	*	*	*	*	3	179	3	0	2	3	20	67	
	2	*	*	*	*	106	31	55	22	33	55	41	174	
	3	*	*	*	*	135	89	176	60	0	77	74	31	
		*	*	*	*	244	299	234	82	35	135	135	272	1446
1957	1	15	42	75	65	3	20	91	62	0	0	25	134	
	2	144	85	67	15	0	2	21	0	0	0	5	75	
	3	122	99	98	42	44	4	52	0	0	12	134	5	
		281	226	240	122	47	26	164	62	0	12	164	214	1458
1958	1	94	251	113	39	51	28	141	120	0	50	72	76	
	2	36	175	116	117	143	0	0	24	29	115	120	101	
	3	164	49	89	81	4	103	58	34	42	2	0	286	
		294	475	318	237	198	131	199	178	71	167	192	463	2923
1959	1	170	70	53	18	18	40	69	0	7	2	37	158	
	2	86	105	115	80	15	36	0	0	0	20	78	99	
	3	104	17	114	95	16	0	3	0	0	10	108	11	
		360	192	282	193	49	76	72	0	7	32	223	268	1754
1960	1	62	17	18	103	76	*	11	0	14	0	39	8	
	2	18	117	34	74	113	*	0	0	0	0	163	61	
	3	109	57	99	21	35	*	0	0	0	41	127	38	
		189	191	151	198	224	*	11	0	14	41	329	107	1445
1961	1	91	118	124	18	67	0	0	0	0	6	172	83	
	2	36	170	1	99	34	0	21	0	0	0	53	182	
	3	59	41	119	127	0	15	0	0	0	63	47	96	
		186	329	244	244	101	15	21	0	0	69	272	363	1842
1962	1	138	148	44	117	12	13	25	3	0	0	104	61	
	2	151	184	56	164	0	13	13	33	6	22	42	141	
	3	182	88	173	138	0	13	0	0	0	35	4	327	
		471	422	273	419	12	39	38	36	6	57	150	529	2450
1963	1	137	130	89	20	0	13	0	0	0	0	89	166	
	2	101	95	57	38	0	0	0	0	0	0	22	128	
	3	81	94	181	0	18	0	0	0	0	0	2	83	
		319	319	327	58	18	13	0	0	0	0	113	377	1544

Data 1.10.2 (continued-2)

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1964	1	0	*	119	57	62	80	0	15	0	136	125	46	
	2	64	*	53	128	30	21	0	36	7	28	7	84	
	3	70	*	147	7	93	0	3	17	40	66	1	39	
		134	*	319	192	185	101	3	68	47	230	133	169	1571
1965	1	93	137	139	69	0	0	0	0	0	0	0	59	
	2	70	118	78	9	0	0	0	0	0	0	95	81	
	3	103	134	36	0	52	0	0	0	0	27	181	90	
		266	389	253	78	52	0	0	0	0	27	276	230	1571
1966	1	69	65	172	48	0	69	0	0	26	89	0	75	
	2	116	148	332	17	39	0	0	0	3	77	130	49	
	3	72	119	60	108	0	0	0	3	0	55	81	36	
		257	332	564	173	39	69	0	3	29	221	211	160	2058
1967	1	129	59	97	177	2	0	0	0	0	2	17	113	
	2	35	48	18	10	2	0	0	0	0	2	38	93	
	3	74	94	67	12	7	0	0	0	0	14	94	128	
		238	201	182	199	11	0	0	0	0	18	149	334	1332
1968	1	166	29	150	223	55	8	33	14	11	22	57	134	
	2	73	117	83	0	83	95	36	15	21	50	71	76	
	3	146	134	115	156	38	17	67	31	23	21	27	0	
		385	280	348	379	176	120	136	60	55	93	155	210	2397
1969	1	14	99	9	250	7	5	0	0	0	0	195	129	
	2	96	79	177	153	0	0	0	0	0	30	29	72	
	3	76	59	128	0	13	0	0	0	0	157	72	3	
		186	237	314	403	20	5	0	0	0	187	296	204	1852
1970	1	79	89	21	75	90	0	0	0	6	0	32	64	
	2	74	43	170	50	85	0	4	0	10	11	72	101	
	3	99	0	67	50	9	0	0	3	18	28	239	73	
		252	132	258	175	184	0	4	3	34	39	343	238	1662
1971	1	34	108	77	36	42	27	18	0	6	34	115	71	
	2	21	66	77	19	0	0	0	0	17	65	62	151	
	3	63	52	185	3	75	79	15	30	5	54	49	39	
		118	226	339	58	117	106	33	30	28	153	226	261	1695

Data 1.10.2 (continued-3)

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1972	1	85	44	138	49	32	0	0	4	0	0	3	59	
	2	154	36	106	138	70	0	0	0	0	0	130	102	
	3	117	24	44	29	0	0	0	0	0	0	60	102	
		356	104	288	216	102	0	0	4	0	0	193	222	1485
1973	1	227	144	75	23	28	44	25	11	0	16	40	150	
	2	209	144	46	184	65	53	77	20	65	23	29	67	
	3	99	74	108	149	81	34	0	0	140	76	38	59	
		535	362	229	356	174	131	102	31	205	115	107	276	2623
1974	1	93	312	128	294	68	0	0	35	44	124	66	56	
	2	36	93	133	47	42	0	13	22	52	35	155	90	
	3	76	220	45	50	0	28	41	45	20	90	78	10	
		205	625	306	391	110	28	54	102	116	249	299	136	2485
1975	1	90	131	83	43	60	0	0	0	25	177	0	85	
	2	66	166	57	182	118	0	38	19	105	65	78	57	
	3	111	57	176	112	15	8	0	30	25	191	26	61	
		267	354	316	337	193	8	38	49	155	433	104	203	2457

Data 1.10.3 Rainfall in Every Ten-day Period

Station name: Bekonang

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1952	1	*	*	*	116	0	0	0	0	0	20	59	5	
	2	*	*	*	14	52	0	1	26	14	26	169	93	
	3	*	*	*	0	71	0	0	52	42	104	44	76	
					130	123	0	1	78	56	150	272	174	984
1953	1	23	313	68	122	123	0	36	0	0	0	44	5	
	2	106	55	107	51	16	0	0	0	0	0	42	81	
	3	93	131	158	153	0	2	0	0	0	0	79	98	
		222	499	313	326	139	2	36	0	0	0	165	174	1876
1954	1	80	103	13	104	157	17	40	19	66	0	105	104	
	2	134	61	105	63	112	29	0	39	0	117	108	7	
	3	191	68	21	95	23	0	0	5	30	116	204	75	
		405	232	139	262	292	46	40	63	96	233	317	186	2311
1955	1	88	121	33	40	40	68	20	5	17	16	152	115	
	2	102	9	87	19	3	29	45	10	7	40	101	125	
	3	30	12	96	54	5	48	287	63	35	84	123	143	
		220	142	216	113	48	145	352	78	59	140	376	383	2272
1956	1	0	0	0	0	74	71	0	30	43	0	2	77	
	2	0	0	0	0	6	69	82	50	8	33	2	77	
	3	0	0	0	0	84	102	11	31	17	15	115	2	
		0	0	0	0	164	242	93	111	68	48	119	156	1001
1957	1	8	61	172	95	34	16	55	0	0	0	10	151	
	2	29	52	54	9	0	0	23	30	0	0	15	100	
	3	83	86	78	78	11	8	0	0	0	17	171	82	
		120	199	304	182	45	24	78	30	0	17	196	333	1528
1958	1	26	230	117	42	166	0	121	27	0	65	89	75	
	2	37	49	155	175	88	0	0	2	92	95	35	85	
	3	101	46	166	56	0	20	56	3	70	0	0	160	
		164	325	438	273	254	20	177	32	162	160	144	320	2469
1959	1	177	87	76	38	14	52	47	0	65	0	22	149	
	2	40	130	216	52	69	24	0	0	0	34	63	116	
	3	75	80	132	109	16	0	0	2	0	35	128	36	
		292	297	424	199	99	76	47	2	65	69	213	301	2084

Date 1.10.3 (Continued-1)

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1960	1	48	60	48	100	60	0	0	0	11	0	45	15	
	2	19	220	22	71	89	43	0	0	0	10	168	25	
	3	139	192	99	15	6	0	0	0	9	69	127	84	
		206	472	169	186	155	43	0	0	20	79	340	124	1794
1961	1	68	61	45	45	38	0	0	0	0	0	58	15	
	2	87	167	49	82	3	0	12	0	0	0	105	104	
	3	85	52	44	56	0	2	0	0	0	50	18	120	
		240	280	138	183	41	2	12	0	0	50	181	239	1366
1962	1	114	101	28	121	0	30	18	24	12	0	45	56	
	2	134	118	98	150	0	80	0	38	6	27	50	127	
	3	105	86	186	88	0	6	19	0	0	78	135	281	
		353	305	312	359	0	116	37	62	18	105	230	464	2361
1963	1	124	65	63	43	66	12	0	0	0	20	33	48	
	2	128	50	120	220	0	0	0	0	0	0	7	120	
	3	30	76	113	31	0	0	0	0	0	0	12	125	
		282	191	296	294	66	12	0	0	0	20	52	293	1506
1964	1	5	110	216	55	35	11	0	0	0	44	191	50	
	2	15	39	127	114	0	40	0	27	12	146	0	186	
	3	57	30	145	23	170	14	0	0	26	142	0	78	
		77	179	488	192	205	65	0	27	38	332	191	314	2108
1965	1	202	77	130	170	2	10	0	0	0	0	10	66	
	2	60	133	18	7	0	0	7	0	0	0	30	101	
	3	214	111	0	5	35	10	0	0	0	32	130	52	
		476	321	148	182	37	20	7	0	0	32	170	219	1612
1966	1	195	90	137	63	3	104	0	0	23	88	0	112	
	2	0	380	238	60	52	0	0	0	0	70	57	65	
	3	101	153	58	111	0	0	0	0	0	63	120	80	
		296	623	433	234	55	104	0	0	23	221	177	257	2423
1967	1	202	113	42	*	*	0	0	0	0	10	65	75	
	2	60	17	0	*	*	0	0	0	0	4	57	21	
	3	214	191	61	*	*	0	0	0	25	0	53	-	
		476	321	103	*	*	0	0	0	25	14	175	96	-

Data 1.10.3 (continued-2)

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1968	1	123	53	93	168	110	21	32	55	0	56	115	67	
	2	54	77	75	60	55	63	51	15	74	86	183	164	
	3	44	118	127	56	37	37	101	10	13	11	20	74	
		221	248	295	284	202	121	184	80	87	153	318	395	2498
1969	1	5	67	33	260	49	14	0	0	0	0	14	106	
	2	55	124	48	63	0	0	0	0	0	12	20	90	
	3	67	121	176	68	46	0	0	0	0	92	42	7	
		127	312	257	391	95	14	0	0	0	104	76	203	1579
1970	1	102	49	69	54	91	2	0	0	26	12	*	*	
	2	15	68	146	57	72	14	23	0	11	13	*	*	
	3	264	26	17	7	37	0	0	0	27	56	*	*	
		381	143	232	118	200	16	23	0	64	81	*	*	
1971	1	*	*	170	*	43	31	6	0	11	*	*	*	
	2	*	*	117	*	18	0	0	0	27	*	*	*	
	3	*	*	189	*	85	50	48	0	17	*	*	*	
		*	*	476	*	146	81	54	0	55	*	*	*	
1972	1	111	*	*	*	*	0	0	*	*	*	4	51	
	2	61	*	*	*	*	0	0	*	*	*	107	56	
	3	10	*	*	*	*	0	0	*	*	*	63	35	
		182	*	*	*	*	0	0	*	*	*	174	142	
1973	1	*	*	*	87	27	86	0	0	0	0	0	0	
	2	*	*	*	68	63	40	34	33	0	0	0	0	
	3	*	*	*	85	92	28	16	0	0	0	0	0	
		*	*	*	240	182	154	50	33	0	0	0	0	659
1974	1	80	65	142	385	88	0	0	35	57	148	12	102	
	2	61	68	32	123	42	0	8	24	132	19	163	58	
	3	20	130	173	81	9	0	81	27	40	89	109	119	
		161	263	347	589	139	0	89	86	229	256	284	273	2722
1975	1	114	207	119	35	37	0	23	0	17	37	12	192	
	2	37	139	78	143	159	5	45	0	66	69	57	118	
	3	305	51	95	201	12	0	0	15	38	131	59	29	
		456	297	292	379	208	5	68	15	121	237	128	339	2545

Data 1.10.4 Rainfall in Every Ten-day Period

Station name: Masaran

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1956	1	*	*	*	*	0	120	0	13	151	39	27	150	
	2	*	*	*	*	46	5	62	69	21	83	11	211	
	3	*	*	*	*	88	53	76	54	4	50	53	7	
						134	178	138	136	176	172	91	368	-
1957	1	70	27	178	112	0	0	42	2	1	0	50	156	
	2	50	18	44	52	9	0	66	0	0	9	113	144	
	3	55	145	264	82	17	10	56	0	0	98	90	26	
		175	190	487	246	26	10	164	2	1	107	253	326	1987
1958	1	85	156	119	68	190	8	117	38	3	125	201	140	
	2	128	122	210	117	65	0	27	4	19	115	136	90	
	3	134	47	231	164	10	15	47	20	156	24	0	184	
		347	325	560	349	265	23	191	62	178	264	337	414	3315
1959	1	86	46	86	14	23	27	27	0	33	24	12	170	
	2	75	158	126	50	98	6	0	0	0	28	85	117	
	3	111	34	144	140	55	0	25	3	0	15	117	38	
		272	238	356	204	176	33	52	3	33	67	214	325	1978
1960	1	52	145	33	33	31	0	16	0	0	2	114	39	
	2	111	131	48	88	34	40	0	1	0	7	235	30	
	3	67	205	118	48	29	0	0	0	4	105	162	144	
		230	481	199	169	94	40	16	1	4	114	511	213	2082
1961	1	73	30	109	22	142	42	1	0	0	3	148	75	
	2	105	132	178	68	9	0	1	0	7	0	120	129	
	3	102	6	66	46	1	0	0	0	0	19	34	54	
		280	168	393	136	152	42	2	0	7	22	302	258	1724
1962	1	242	93	39	265	9	69	84	13	0	12	73	56	
	2	133	138	65	169	0	48	92	31	12	79	8	97	
	3	74	48	128	121	0	0	0	0	0	28	133	65	
		449	279	232	555	9	123	176	44	12	119	214	218	2307
1963	1	108	51	86	116	5	40	0	0	0	66	20	56	
	2	55	104	97	122	0	0	0	0	0	0	40	109	
	3	61	169	99	57	0	0	0	0	0	22	12	57	
		224	324	282	295	5	40	0	0	0	88	72	222	1552

Data 1.10.4 (continued-1)

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1964	1	87	150	142	99	110	82	19	0	5	70	42	30	
	2	10	151	34	148	20	23	0	19	6	89	18	139	
	3	141	98	22	1	100	0	0	0	15	59	16	72	
		328	399	198	248	230	105	19	19	26	218	96	241	2127
1965	1	51	98	119	114	6	0	17	0	0	0	32	42	
	2	147	64	221	16	0	18	25	0	0	0	93	31	
	3	110	46	74	0	75	60	0	0	0	0	50	95	
		308	208	414	130	81	78	42	0	0	0	175	168	1604
1966	1	219	20	135	46	31	26	0	0	0	35	23	117	
	2	57	175	124	0	49	0	0	0	4	141	113	55	
	3	123	93	30	180	11	0	0	3	0	142	66	30	
		399	288	289	226	91	26	0	3	4	318	202	202	2048
1967	1	198	88	64	41	10	0	0	0	0	33	16	112	
	2	158	39	16	11	44	0	0	0	0	2	7	32	
	3	200	79	223	7	0	0	0	0	0	7	91	73	
		556	206	303	59	54	0	0	0	0	42	114	217	1551
1868	1	61	126	134	191	21	103	79	62	4	29	270	111	
	2	143	117	147	1	160	71	132	11	2	79	93	104	
	3	134	112	174	50	60	58	130	36	25	85	61	49	
		338	355	455	242	241	232	341	109	31	193	424	264	3225
1969	1	20	35	45	178	0	0	0	0	0	69	67	42	
	2	136	199	143	9	13	0	0	14	0	10	28	245	
	3	317	142	134	73	33	0	0	0	0	92	117	213	
		473	376	322	260	46	0	0	14	0	171	212	500	2203
1970	1	37	184	115	110	90	8	0	0	20	6	18	27	
	2	72	202	109	27	53	20	20	0	23	63	103	44	
	3	72	76	10	15	135	15	31	0	61	95	49	84	
		175	462	234	152	278	43	51	0	104	164	170	155	2088
1971	1	20	275	151	74	60	84	2	0	7	13	60	70	
	2	209	109	24	77	28	11	0	0	41	28	94	162	
	3	93	55	214	0	77	12	26	8	46	201	0	73	
		322	439	389	151	165	107	28	8	57	242	154	305	2567

Data 1.10.4 (continued-2)

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1972	1	39	91	117	123	38	0	0	51	0	0	44	43	
	2	116	203	124	47	32	0	0	0	0	0	136	43	
	3	19	9	96	23	4	0	0	3	0	5	52	78	
		174	293	337	193	74	0	0	54	0	5	232	164	1546
1973	1	96	186	122	64	109	46	3	0	3	11	95	48	
	2	84	181	45	83	124	35	89	81	50	35	52	160	
	3	141	77	176	142	36	19	4	21	145	46	42	125	
		321	344	343	289	269	100	96	102	198	92	189	333	2676
1974	1	98	130	262	77	190	3	0	41	44	187	41	133	
	2	144	205	143	101	7	0	5	68	103	43	174	31	
	3	75	119	95	26	11	13	22	34	44	104	66	43	
		317	454	500	204	208	16	27	143	191	334	281	207	2882
1975	1	41	67	145	60	32	3	7	0	8	88	17	37	
	2	58	113	42	133	121	0	2	15	203	114	26	44	
	3	63	37	232	68	54	4	1	15	12	152	29	7	
		162	217	419	261	207	7	10	30	223	354	72	88	2050

Data 1.10.5 Rainfall in Every Ten-day Period

Station name: Mojo

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1956	1	*	*	*	*	0	99	0	30	44	23	23	92	
	2	*	*	*	*	11	13	21	34	47	58	35	123	
	3	*	*	*	*	105	21	5	13	19	41	30	0	
						116	133	26	77	110	122	88	215	-
1957	1	58	36	73	188	39	0	34	2	18	0	35	140	
	2	97	9	61	0	0	1	24	0	0	1	52	142	
	3	66	102	156	54	2	38	125	0	0	17	99	0	
		211	147	290	242	41	39	183	2	18	18	186	282	1659
1958	1	36	158	102	48	119	0	31	83	13	184	158	88	
	2	75	118	233	153	49	0	34	11	28	121	57	192	
	3	108	52	270	40	33	34	88	4	33	10	0	221	
		219	348	605	241	201	34	153	98	74	315	215	501	3004
1959	1	98	102	37	103	25	106	47	0	29	38	25	167	
	2	46	149	137	146	145	0	0	0	0	12	49	192	
	3	195	88	117	121	66	0	0	0	0	4	150	55	
		339	339	291	370	236	106	47	0	29	54	224	414	2449
1960	1	34	159	32	126	55	0	52	0	0	0	146	35	
	2	98	96	121	100	27	15	0	0	1	33	220	55	
	3	42	94	78	21	64	0	0	0	6	93	184	83	
		174	349	231	247	146	15	52	0	7	126	550	173	2070
1961	1	82	17	129	12	86	20	3	0	0	0	68	55	
	2	110	219	81	73	30	0	3	0	0	0	95	78	
	3	83	6	145	29	0	0	0	0	0	22	50	56	
		275	242	355	114	116	20	6	0	0	22	213	189	1552
1962	1	188	97	27	240	9	19	55	8	0	19	85	58	
	2	167	70	54	41	0	5	97	17	0	35	40	167	
	3	57	40	218	90	0	13	0	0	0	41	158	95	
		412	207	299	371	9	37	152	25	0	95	283	320	2210
1963	1	74	35	98	105	0	17	0	0	0	19	14	56	
	2	56	75	108	86	0	0	0	0	0	0	33	178	
	3	27	106	137	77	0	0	0	0	0	4	19	112	
		157	216	343	268	0	17	0	0	0	23	66	346	1426

Data 1.10.5 (continued-2)

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1964	1	97	60	167	68	125	132	69	0	0	68	67	22	
	2	49	96	53	185	0	5	0	33	20	201	20	147	
	3	84	39	16	11	134	0	0	23	16	34	27	52	
		230	195	236	264	259	137	69	56	36	303	114	221	2020
1965	1	50	76	122	122	3	0	0	0	0	0	83	76	
	2	122	53	250	9	0	9	4	0	0	0	105	62	
	3	91	20	63	0	13	30	0	0	0	15	107	65	
		263	149	435	131	16	39	4	0	0	15	295	203	1560
1966	1	224	24	95	54	18	25	0	0	0	105	57	0	
	2	61	162	159	0	48	0	0	0	0	66	30	0	
	3	81	158	16	164	3	0	0	0	0	27	123	0	
		376	344	270	218	69	25	0	0	0	198	210	0	1710
1967	1	195	29	43	49	0	0	0	0	0	28	24	42	
	2	135	11	19	23	6	0	0	0	0	8	11	46	
	3	205	106	121	19	0	0	0	0	24	2	105	56	
		535	146	183	91	6	0	0	0	24	38	140	144	1307
1968	1	69	142	141	163	35	34	10	44	0	0	251	143	
	2	174	134	70	21	164	91	79	20	34	68	102	60	
	3	145	80	242	36	56	68	53	14	0	79	114	77	
		388	356	453	220	255	193	142	78	34	147	467	280	3013
1969	1	25	17	27	118	0	4	0	0	0	39	74	50	
	2	170	182	138	13	11	8	0	0	0	0	45	201	
	3	189	127	136	7	29	0	0	0	0	31	0	102	
		384	326	301	138	40	12	0	0	0	70	119	353	1743
1970	1	40	184	139	31	59	22	0	0	10	4	7	74	
	2	24	67	126	0	60	66	27	0	14	7	113	16	
	3	90	81	100	73	73	0	33	0	52	23	114	76	
		154	332	365	104	192	88	60	0	76	34	234	166	1805
1971	1	19	402	100	11	85	53	5	0	5	41	52	18	
	2	149	72	31	123	96	9	0	0	7	73	90	144	
	3	122	68	260	0	79	6	13	0	13	378	80	17	
		280	542	391	134	260	68	18	0	25	492	222	179	2611

Date 1.10.5 (continued-3)

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1972	1	102	67	125	85	148	19	0	0	0	0	25	31	
	2	137	123	134	23	30	0	0	0	0	0	143	77	
	3	11	0	60	49	3	0	0	0	0	3	95	83	
		250	190	319	157	181	19	0	0	0	3	263	191	1573
1973	1	116	249	136	5	59	48	25	6	0	15	144	37	
	2	112	272	0	89	131	3	80	19	25	0	125	167	
	3	43	36	204	84	43	0	0	19	171	102	67	151	
		271	557	340	178	233	51	105	44	196	117	336	355	2683
1974	1	68	74	248	193	203	4	0	0	18	99	28	156	
	2	66	178	145	161	0	0	9	30	129	6	116	97	
	3	35	220	157	0	30	20	10	23	0	88	37	41	
		169	472	550	354	233	24	19	53	147	193	181	294	2689
1975	1	68	171	195	43	30	0	32	20	7	70	34	39	
	2	102	174	75	219	146	0	0	5	129	78	36	39	
	3	127	48	282	60	61	0	9	0	33	188	10	29	
		297	393	552	322	237	0	41	25	169	336	80	107	2559

Date. 1.10.6 Rainfall in Every Ten-day Period

Station name: Bakalan

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1956	1	*	*	*	*	0	42	12	12	46	50	53	125	
	2	*	*	*	*	16	73	11	47	30	113	47	71	
	3	*	*	*	*	133	39	3	15	0	13	186	0	
						149	154	26	74	76	177	286	196	-
1957	1	107	29	78	152	73	0	52	0	0	0	24	163	
	2	80	2	118	0	0	0	23	12	0	31	48	173	
	3	87	102	185	70	23	45	74	0	0	48	92	14	
		274	133	381	222	96	45	149	12	0	79	171	350	1912
1958	1	10	400	56	99	132	4	16	17	6	40	209	126	
	2	77	232	149	103	50	0	110	39	46	69	155	145	
	3	86	81	177	81	22	43	42	12	60	24	11	267	
		173	723	382	283	104	47	168	68	112	133	375	538	3206
1959	1	81	71	27	21	23	48	83	0	59	6	17	100	
	2	57	130	148	65	99	0	0	0	0	64	13	177	
	3	77	69	122	93	37	0	3	0	0	42	71	75	
		215	270	297	179	159	48	86	0	59	112	101	352	1878
1960	1	99	167	47	68	120	0	22	0	0	24	62	11	
	2	63	105	9	44	47	14	0	0	4	50	270	131	
	3	88	107	69	31	95	0	0	0	25	81	198	37	
		250	319	125	143	262	14	22	0	29	155	530	179	2088
1961	1	106	11	73	0	60	23	0	0	0	0	136	89	
	2	48	116	81	103	25	0	1	0	12	4	73	132	
	3	67	3	164	80	0	0	0	0	0	29	77	19	
		221	130	318	183	85	23	1	0	12	33	286	240	1533
1962	1	126	54	44	116	78	79	37	0	0	0	72	67	
	2	44	94	39	158	0	1	85	67	44	97	71	184	
	3	50	44	134	93	0	9	0	0	1	63	49	34	
		240	192	215	367	18	29	122	61	5	160	192	285	1896
1963	1	176	61	110	99	10	45	0	0	0	21	37	71	
	2	32	88	47	98	0	0	0	0	0	7	79	60	
	3	65	36	71	39	0	0	0	0	0	5	33	131	
		213	185	228	236	10	45	0	0	0	33	149	262	1361

Date. 1.10.6 (continued-1)

Year	Ten-day period	J	D	M	A	M	J	J	A	S	O	N	D	Annual
1964	1	30	28	157	103	113	65	0	0	0	78	63	0	
	2	27	36	0	55	29	0	0	19	34	310	42	64	
	3	95	31	37	0	11	0	0	32	28	28	6	20	
		152	95	194	158	153	65	0	51	62	416	111	84	1541
1965	1	82	99	79	156	0	0	0	0	0	0	90	95	
	2	109	72	133	0	0	0	36	0	0	26	61	49	
	3	54	28	0	0	7	18	0	0	0	35	108	43	
		245	199	212	156	7	18	36	0	0	61	259	187	1380
1966	1	65	63	53	72	17	61	0	0	0	100	105	101	
	2	32	142	130	6	87	2	0	0	37	89	19	66	
	3	59	130	16	21	21	0	0	0	0	8	46	75	
		157	335	199	99	125	63	0	0	37	197	170	242	1624
1967	1	169	60	55	19	0	0	0	0	0	10	75	33	
	2	140	43	18	27	11	0	0	0	0	18	134	72	
	3	353	133	113	63	0	0	0	0	0	1	67	199	
		662	236	186	109	11	0	0	0	0	29	276	304	1813
1968	1	23	145	73	125	111	70	4	21	0	29	244	172	
	2	190	106	91	37	169	13	72	4	51	13	76	71	
	3	137	49	179	75	117	47	32	77	21	40	72	97	
		350	300	343	237	397	124	108	102	72	82	392	340	2847
1969	1	17	23	19	110	0	35	0	0	0	30	114	49	
	2	56	131	133	45	13	3	0	0	0	19	0	168	
	3	135	95	47	29	47	0	0	0	0	147	58	65	
		208	249	199	184	60	38	0	0	0	196	172	282	1588
1970	1	85	126	116	107	12	22	0	0	24	20	71	22	
	2	50	39	272	17	56	21	5	2	32	35	104	36	
	3	54	88	107	67	16	0	0	0	45	6	125	132	
		189	253	495	191	74	43	5	2	101	61	302	190	896
1971	1	38	215	160	135	27	59	11	0	9	65	46	56	
	2	107	91	138	128	73	26	0	0	23	80	214	128	
	3	98	114	199	0	113	41	14	0	9	192	52	9	
		243	420	497	263	213	126	25	0	41	337	312	193	2670

Date 1.10.6 (continued-2)

Year	Ten-day period	J	F	M	A	M	J	J	A	S	O	N	D	Annual
1972	1	290	88	100	79	60	0	0	2	0	0	8	48	
	2	208	55	67	8	48	0	0	16	0	10	197	83	
	3	17	74	129	0	0	0	0	0	0	42	90	75	
		515	217	296	87	108	0	0	18	0	52	295	206	1794
1973	1	146	177	72	44	58	54	10	3	4	0	78	56	
	2	83	265	79	107	139	16	90	38	72	3	130	68	
	3	37	111	228	53	29	7	0	65	102	83	67	119	
		266	553	379	204	226	77	100	106	178	86	275	243	2693
1974	1	65	167	199	164	179	0	0	19	67	166	23	30	
	2	86	79	158	119	0	4	0	0	79	0	81	83	
	3	12	94	115	2	0	17	12	67	48	146	54	38	
		163	340	472	285	179	21	12	86	184	312	158	151	2363
1975	1	101	129	172	96	76	0	9	0	5	175	35	45	
	2	41	134	95	88	28	23	0	0	151	42	58	132	
	3	51	44	100	104	36	0	0	11	32	54	62	99	
		193	307	367	288	140	23	9	11	188	271	155	276	2228

Data-2. EXISTING WATER USE

Data 2.1 Existing Monthly Average Irrigation Water Use in Each Water Source

Date source: "Dafter Adanya Lapuran Pasten Air" in D.P.U. Office

2.1.1 K. Jalantan/Wd. Mulur (T)

Kdl. Sukoharjo/Sks. Karanganyar
Technical area
Irrigable area 5,107 ha

Unit: ℓ/sec

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
Year													
1966	*	1,385	1,632	1,243	964	754	862	308	74	226	1,600	1,055	918
1967	*	1,250	1,134	1,465	1,283	597	121	100	40	49	302	1,078	673
1968	867	1,240	1,648	867	882	799	775	368	348	531	1,303	884	876
1969	712	1,969	*	983	898	768	603	95	78	76	847	1,873	809
1970	960	831	518	1,398	802	1,069	858	35	38	681	1,122	1,776	841
1971	1,887	1,905	1,151	1,652	1,379	1,121	735	44	10	468	968	1,277	1,050
1972	2,223	1,560	1,188	1,133	1,048	840	111	12	7	6	263	1,206	800
1973	1,466	1,520	1,780	1,717	*	1,656	874	106	68	434	1,602	1,894	1,192
1974	1,614	1,741	2,604	2,328	*	988	218	28	606	*	2,017	1,381	1,518
1975	*	*	*	1,991	1,643	1,562	182	8	140	*	*	*	1,873
Ave.	1,390	1,489	1,457	1,478	1,112	1,013	534	110	141	309	1,114	1,380	

2.1.2 K. Jlantan, Others (1/2T)

Kdl. Sukoharjo/Sks. Karanganyar
Semi-technical area
Irrigable area 2,733 ha

Unit: ℓ/sec

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
Year													
1966	*	523	1,006	348	153	62	30	*	*	1,132	372	650	475
1967	*	510	334	323	77	*	*	*	*	*	97	432	296
1968	351	550	859	800	659	576	323	307	231	282	907	1,613	622
1969	759	660	*	381	61	92	12	*	*	169	194	237	285
1970	572	1,244	1,089	967	1,852	189	58	97	86	25	256	406	570
1971	811	1,208	1,015	823	693	245	254	73	10	68	302	1,206	559
1972	1,085	1,023	1,074	266	600	78	20	10	5	5	157	464	399
1973	852	1,058	1,186	970	*	260	224	102	88	390	826	992	632
1974	1,177	1,449	2,240	1,248	*	248	144	86	368	472	1,075	922	857
1975	1,817	1,823	1,871	1,300	614	*	210	226	218	*	*	*	1,010
Ave.	928	1,005	1,186	743	589	219	142	129	144	318	465	769	

Note: * None date

2.1.3 B. Gemb. Truni/K. Samin (T)

Kdl. Bekonang/Sks. Karanganyar
Technical area
Irrigabla area 2,137 ha

Unit: ℓ/sec

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
Year													
1966	*	693	487	919	796	474	507	68	34	449	849	812	553
1967	*	540	722	955	955	253	158	59	34	44	429	750	445
1968	530	710	850	747	*	290	550	*	664	479	540	550	591
1969	585	637	*	691	643	545	316	165	103	102	226	496	410
1970	1,466	1,550	1,670	624	653	663	495	96	221	173	1,100	537	771
1971	585	583	590	601	662	670	538	217	217	497	783	509	535
1972	599	624	1,008	1,343	697	332	157	78	8	16	335	668	489
1973	904	1,647	684	859	*	1,090	830	156	116	181	104	613	653
1974	*	588	*	598	*	984	882	156	116	*	1,346	1,254	1,010
1975	1,514	1,645	896	1,589	968	1,073	1,056	187	108	*	*	*	1,004
Ave.	883	992	863	893	768	637	548	131	162	240	635	688	

2.1.4 B. Kaliduren/K. Buret (T)

Kdl. Bekonang/Sks. Karanganyar
Technical area
Irrigable area 631 ha

Unit: ℓ/sec

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	nOv.	Dec.	Ave.
Year													
1966	171	150	166	145	110	102	60	21	16	79	119	113	104
1967	136	118	106	44	33	14	10	8	6	11	65	-	50
1968	150	123	127	101	109	102	150	78	22	44	118	124	104
1969	103	96	113	140	-	45	13	13	23	27	59	88	65
1970	100	108	101	95	94	75	26	15	27	29	87	100	71
1971	110	104	102	68	52	38	16	13	20	16	47	136	60
1972	70	50	111	88	67	13	11	11	11	8	44	103	49
1973	117	112	112	101	125	90	73	24	20	52	95	210	94
1974	192	110	120	116	58	30	52	27	27	65	85	59	78
1975	70	58	60	38	43	16	20	19	46	69	48	*	44
Ave.	122	103	112	94	77	53	43	23	22	40	77	117	

2.1.5 B. Dari/K.Umet (T)

Kdl. Bekonang/Sks. Karanganyar
Technical area
Irrigable area 500 ha

unit: ℓ/sec

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
Year													
1966	181	213	129	183	125	72	31	5	5	59	99	181	107
1967	267	270	174	124	22	10	*	8	6	6	42	*	93
1968	210	190	228	192	174	103	88	55	14	32	296	195	148
1969	176	170	181	175	119	57	9	27	7	14	63	108	92
1970	136	163	179	177	174	262	51	25	18	22	99	205	125
1971	202	207	211	187	110	123	59	26	7	60	103	219	126
1972	190	107	113	63	65	19	7	7	6	6	31	108	60
1973	164	175	138	145	91	140	64	31	57	63	103	170	112
1974	161	209	193	201	196	71	60	67	93	132	137	148	139
1975	154	171	87	97	89	60	45	30	52	122	174	163	104
Ave.	184	188	163	154	117	92	46	28	27	52	115	166	

2.1.6 Gemb. Truni/K. Samin (T)

Kdl. Karanganyar/Sks. Karanganyar
Technical area
Irrigable area 2,183 ha

unit: ℓ/sec

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
Year													
1966	669	710	527	798	733	404	154	63	72	499	709	793	511
1967	641	587	555	967	639	155	145	100	54	46	424	683	416
1968	801	662	515	574	*	518	429	*	240	479	509	528	526
1969	568	591	637	579	620	418	139	124	74	113	257	329	371
1970	482	607	522	456	641	631	371	101	211	146	433	488	424
1971	539	528	528	591	622	646	497	206	153	463	557	478	484
1972	606	596	558	599	865	328	133	135	37	63	272	461	387
1973	475	467	491	438	393	512	527	332	210	16	*	222	371
1974	15	368	468	304	583	524	427	492	389	592	538	447	429
1975	359	113	175	227	83	241	223	136	230	22	*	24	167
Ave.	516	523	498	553	575	438	305	188	167	244	462	445	

2.1.7 B. Kalongan/K. Siwaluh (T)

Kdl. Tasikmadu/Sks. Karanganyar
Technical area
Unit: ℓ/sec
Irrigable area 2,022 ha

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
Year													
1966	*	1,079	1,274	945	892	883	321	408	159	392	747	993	736
1967	*	1,113	903	1,140	704	487	417	336	189	70	391	1,173	629
1968	1,142	756	1,296	915	1,140	1,025	1,199	819	255	502	1,109	1,256	951
1969	1,314	1,133	*	1,154	714	725	631	177	103	161	454	887	677
1970	1,079	1,070	1,190	830	1,060	844	521	414	270	162	964	1,257	805
1971	1,358	1,457	1,354	842	1,248	1,124	1,005	464	253	763	705	1,448	1,002
1972	1,400	1,203	1,256	799	760	525	492	292	116	105	332	900	682
1973	946	1,018	1,446	1,317	*	1,012	892	506	356	468	1,316	1,974	1,023
1974	1,312	1,245	1,960	1,790	*	948	602	356	486	1,408	1,297	1,510	1,023
1975	1,515	1,445	1,513	1,217	1,216	1,348	513	282	558	623	1,300	611	1,012
Ave.	1,258	1,170	1,355	1,095	967	897	659	405	275	465	862	1,201	

2.1.8 B. Ledok/K. Kumpul (1/2T)

Kdl. Tasikmadu/Sks. Karanganyar
Semi-technical area
Unit: ℓ/sec
Irrigable area 633 ha

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
Year													
1966	*	360	299	249	150	107	641	5	4	94	169	272	214
1967	*	281	162	244	191	32	118	16	69	27	128	302	143
1968	349	332	357	342	340	349	325	262	141	210	355	398	313
1969	303	386	*	342	93	130	167	10	10	75	304	261	189
1970	343	383	365	383	362	275	63	21	122	76	267	250	243
1971	335	193	338	314	348	242	143	80	58	416	258	211	245
1972	170	179	195	190	155	60	14	21	37	13	134	375	129
1973	465	407	520	548	*	166	142	56	48	69	488	720	330
1974	469	500	368	320	*	440	62	40	52	734	470	501	360
1975	501	453	445	244	253	270	41	24	72	297	533	481	301
Ave.	367	347	344	318	237	207	172	54	61	201	311	377	

2.1.9 B. Lencong/K. Jirak, Cobor (T) Kdl. Tasikmadu/Sks. Karanganyar
Technical area
Unit: ℓ/sec Irrigable area 450 ha

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
Year													
1967	*	*	*	*	*	*	*	*	*	*	37	185	111
1968	265	255	264	205	211	253	203	31	93	163	276	283	212
1969	238	296	256	255	227	163	70	63	*	8	45	157	177
1970	223	246	225	147	188	180	72	48	31	22	104	193	140
1971	301	332	273	212	170	189	171	69	49	89	133	206	183
1972	231	306	322	298	221	115	83	53	13	13	20	210	144
1973	218	306	322	298	284	297	228	124	98	118	183	219	225
1974	131	402	424	336	248	146	147	134	212	235	242	188	237
1975	326	304	300	280	270	157	136	90	145	231	212	201	211
Ave.	242	296	297	246	227	188	139	82	92	124	139	205	

2.1.10 B. Pengin/K. Jirak, Cobor (T) Kdl. Tasikmadu/Sks. Karanganyar
Technical area
Unit: ℓ/sec Irrigable area 898 ha

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Ayg.	Sep.	Oct.	Nov.	Dec.	Ave.
Year													
1967	*	*	*	*	*	*	*	*	*	*	71	276	174
1968	240	252	171	*	*	*	*	*	*	41	88	152	157
1969	147	139	100	931	97	90	95	68	37	27	*	*	173
1970	*	*	*	*	334	340	119	51	75	43	154	256	172
1971	284	348	268	203	178	191	180	104	55	104	192	230	195
1972	285	279	355	284	250	110	65	54	36	31	43	226	168
1973	469	505	469	552	448	402	263	136	83	136	242	349	337
1974	322	402	424	336	248	146	159	149	152	168	193	229	244
1975	180	244	302	*	250	244	137	112	94	296	257	269	217
Ave.	275	310	298	461	258	216	145	96	76	106	155	248	

2.1.11 B. Jungkang/K. Siwaluh (T)

Kdl. Tasikmadu/Sks. Karanganyar
Technical area
Unit: ℓ/sec Irrigable area 624 ha

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
year													
1967	*	*	*	*	*	*	*	*	*	*	130	313	222
1968	295	322	350	277	290	244	256	199	136	122	249	329	256
1969	422	329	336	309	116	106	90	65	41	41	120	287	189
1970	328	337	367	301	366	236	84	52	76	80	290	371	241
1971	418	433	410	152	397	326	349	78	45	253	241	408	293
1972	400	352	368	255	205	89	73	57	30	32	133	401	200
1973	347	390	421	438	115	398	301	113	193	209	149	381	288
1974	362	442	312	379	358	113	189	276	288	342	336	274	306
1975	398	414	390	336	420	168	121	78	374	359	431	445	328
Ave.	371	377	369	306	283	206	183	115	148	180	231	357	

2.1.12 K. Sawur (T)

Sks. Sragen
Technical area
Unit: ℓ/sec Irrigable area 3,137 ha

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
Year													
1966	*	2,150	1,646	628	776	540	399	122	160	552	235	887	736
1967	*	1,560	1,123	638	576	275	196	102	94	128	414	1,452	596
1968	742	1,241	1,216	660	240	453	221	218	380	777	1,628	1,097	739
1969	1,137	943	1,663	264	779	821	382	295	135	522	597	850	699
1970	824	1,017	1,036	864	815	521	637	316	359	116	568	816	657
1971	1,367	920	985	421	364	307	231	584	398	871	1,728	1,025	767
1972	840	813	765	1,057	762	500	255	214	193	197	365	521	540
1973	715	867	857	427	882	843	730	738	594	453	612	746	705
1974	847	*	1,020	1,125	936	716	573	676	877	741	691	885	826
1975	1,004	921	1,026	775	1,110	775	627	459	476	*	963	891	821
Ave.	935	1,159	1,134	686	724	575	425	372	367	484	780	917	

2.1.13 K. Kenatan (T)

Sks. Sragen
Technical area
Unit: ℓ/sec Irrigbale area 4,364 ha

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
Year													
1966	*	2,137	2,149	1,380	1,943	883	643	417	198	285	1,362	1,520	1,174
1967	*	1,954	1,923	1,908	943	503	305	213	76	152	787	1,700	951
1968	2,058	1,568	1,911	1,790	1,829	2,096	2,265	981	643	1,124	2,088	2,772	1,760
1969	2,790	3,102	2,805	3,648	1,521	1,130	839	490	306	445	935	1,739	1,646
1970	2,785	2,687	1,667	2,835	2,676	1,544	1,178	590	586	603	1,325	1,553	1,669
1971	2,776	2,178	2,554	2,694	2,881	1,482	301	821	407	1,622	2,526	2,801	1,920
1972	2,430	2,318	2,928	2,660	2,710	1,277	400	367	233	323	1,449	1,544	1,553
1973	2,168	2,556	2,692	3,341	317	2,592	1,464	940	1,478	911	2,029	3,465	1,996
1974	2,877	*	3,577	3,096	2,707	1,692	1,032	1,374	1,553	237	2,400	2,719	2,115
1975	2,844	2,439	2,563	2,965	3,018	1,521	786	590	1,026	*	2,180	1,940	1,988
Ave.	2,591	2,327	2,477	2,632	2,045	1,472	924	678	650	634	1,708	2,175	

2.1.14 K. Kenatan (1/2T)

Sks. Sragen
Technical area
Unit: ℓ/sec Irrigable area 1,848 ha

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
Year													
1966	*	1,382	993	283	385	32	48	17	15	128	31	528	349
1967	*	851	687	682	91	77	36	26	8	8	17	629	283
1968	538	644	811	645	1,044	44	20	32	49	84	264	672	404
1969	576	851	1,080	568	260	152	90	83	232	56	139	359	371
1970	290	300	399	405	218	124	166	85	66	110	125	129	201
1971	197	288	389	303	118	121	214	208	72	157	972	334	281
1972	328	528	473	136	562	200	50	12	17	89	351	275	252
1973	402	564	567	97	652	478	378	188	196	178	422	448	343
1974	551	*	815	475	556	494	168	74	79	307	396	392	390
1975	712	755	828	907	633	94	20	115	313	*	431	401	474
Ave.	449	685	704	450	452	137	119	84	105	124	315	417	

2.1.15 K. Sragen (T)

Seksi Sragen
Technical area
Unit: ℓ/sec Irrigable area 3,755 ha

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
Year													
1966	*	994	1,123	788	1,111	925	651	167	96	299	775	1,053	726
1967	*	1,280	791	487	392	314	188	67	50	142	350	681	431
1968	957	1,042	868	957	723	1,134	1,242	342	489	1,657	1,416	1,581	1,034
1969	1,591	1,439	1,378	1,440	930	1,057	589	157	157	229	569	1,189	894
1970	1,355	1,475	1,506	1,124	1,214	856	488	107	284	240	624	1,175	871
1971	1,432	1,523	1,418	1,272	1,329	851	562	206	268	501	895	752	917
1972	881	1,396	1,344	1,020	1,120	397	389	204	259	219	584	691	709
1973	1,498	1,883	1,701	1,106	1,254	1,126	835	465	561	565	1,599	1,906	1,208
1974	1,354	*	1,329	947	1,234	979	695	820	2,301	2,132	1,867	1,844	1,409
1975	2,676	1,880	2,019	2,006	1,941	1,251	577	378	839	*	2,019	1,620	1,564
Ave.	1,468	1,435	1,348	1,115	1,125	889	622	291	530	665	1,070	1,249	

2.1.16 K. Djlamprang (T)

Seksi Sragen
Technical area
Unit: ℓ/sec Irrigable area 4,336 ha

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
Year													
1966	-	1,835	1,921	1,323	2,216	1,930	337	368	232	898	1,176	1,496	1,248
1967	-	1,928	1,251	1,356	1,125	432	331	206	223	233	635	1,182	809
1968	1,733	1,433	1,531	1,096	929	1,550	1,112	1,110	469	942	1,450	2,034	1,282
1969	2,212	1,940	1,920	1,642	1,580	1,733	632	476	348	406	1,470	1,928	1,349
1970	1,794	2,040	1,990	2,023	1,295	1,629	974	698	962	672	1,274	2,440	1,483
1971	1,930	2,166	2,086	1,215	1,530	1,500	976	612	507	740	1,190	1,385	1,320
1972	1,511	3,274	2,160	1,744	1,592	892	718	564	636	709	1,150	1,640	1,383
1973	2,592	2,866	1,136	1,916	2,623	1,370	916	686	985	1,788	4,021	3,597	2,039
1974	3,260	2,936	2,307	2,157	2,157	814	556	796	832	2,700	3,092	2,932	2,045
1975	3,086	3,085	2,770	2,596	2,224	1,753	1,324	891	1,013	*	3,076	1,980	2,163
Ave.	2,265	2,350	1,907	1,707	1,727	1,360	787	641	618	1,010	1,853	2,061	

Data 2.2 Actual Ratio of Water Losses in Technical Area

Month	J	F	M	A	M	J	J	A	S	O	N	D	Ave.
Year													
Sragen													
1966	*	15	25	25	35	38	43	46	46	41	*	31	
1967	*	32	39	29	32	40	40	45	51	46	32	23	
1968	22	21	21	27	35	33	36	53	42	40	33	29	
1969	23	26	25	33	39	46	50	58	60	53	36	32	
1970	33	30	19	28	33	40	43	51	40	40	33	34	
1971	28	21	21	35	32	40	45	52	40	31	30	31	
1972	35	40	34	32	44	43	56	60	60	51	34	38	
1973	30	29	45	36	31	31	38	38	42	31	30	30	
1974	28	*	26	35	39	40	43	43	32	33	32	32	
1975	26	26	27	29	30	36	40	30	35	*	27	27	
Ave.	28	27	28	31	35	39	43	48	45	41	32	31	36
Karanganyar													
1966	24	25	24	27	28	33	37	38	39	33	23	24	
1967	24	24	25	26	27	35	35	36	32	37	23	23	
1968	23	23	23	27	30	40	23	25	41	35	36	12	
1969	23	26	*	24	26	32	45	45	45	37	45	28	
1970	34	45	34	35	34	40	40	43	44	43	37	34	
1971	34	34	34	36	36	39	44	44	50	39	35	32	
1972	37	41	33	31	40	37	46	50	53	50	44	34	
1973	34	39	34	34	40	50	50	50	50	50	50	50	
1974	45	32	50	50	45	45	50	50	50	50	30	30	
1975	40	30	35	35	30	35	40	46	42	46	46	46	
Ave.	32	32	32	33	34	39	41	43	45	41	37	31	37

Data source: "Daftar abanya Lapuran Pasten Air" from D.P.U. Office in Wilayah Surakarta.

Data-2.3 **Existing Monthly Irrigation Water Use for Growing Paddy (in Technical Area)**

Table 2.3.1 Bekonang (Seksi Karanganyar) Unit : l/sec/ha

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1965	0,33	0,30	0,72	-	0,30	0,18	0,09	0,09	0,09	-	0,45	0,60	0,32
1966	-	0,45	0,27	-	0,30	0,21	0,24	-	-	0,33	0,30	0,52	0,32
1967	-	0,60	0,45	0,42	0,36	0,21	0,27	-	-	-	0,60	0,30	0,46
1968	0,60	0,30	0,60	0,36	0,42	0,36	0,30	-	0,60	0,30	0,21	0,45	0,41
1969	0,30	0,30	-	0,33	0,30	0,27	0.15	-	-	0,18	0,30	0,15	0,29
1970	0,60	0,75	0,60	0,30	0,30	0,36	0.18	0,27	-	0,36	0,36	0,30	0,40
1971	0,30	0,36	0,33	0,27	0,24	0,27	0,27	0,45	0,60	0,60	0,33	0,21	0,35
1972	0,09	0,33	0,39	0,60	0,27	0,12	0,15	0,18	0,24	0,18	0,36	0,27	0,27
1973	0,42	0,39	0,30	0,33	-	0,39	0,33	0,30	0,33	0,48	-	-	0,33
1974	-	0,30	-	0,18	-	0,27	0,30	0,30	0,42	0,60	0,60	0,60	0,40
1975	0,60	0,60	0,60	0,45	0,45	0,45	0,36	0,30	0,45	0,45	-	0,60	0,48
Mean	0,41	0,43	0,47	0,36	0,33	0,28	0,24	0,27	0,45	0,39	0,39	0,40	0,37

Note : 1). Ratio of Irrigation Water Use for "Growing stage paddy" compared with polowijo (Pasten) is 3.0.
2). Ratio for Sugar cane is 2.0

Data source : D.P.U. office in Wilayah Surakarta.

Table 2.3.2 Tasikmadu (Seksi Karanganyar).

Unit : l/sec/ha.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1965	0,27	0,33	0,36	-	0,18	0,24	0,18	0,27	0,15	-	0,36	0,60	0,29
1966	-	0,45	0,42	0,39	0,36	0,39	0,24	0,18	-	0,24	0,36	0,45	0,35
1967	-	0,30	0,18	-	0,48	0,18	0,18	0,30	0,18	-	0,18	0,39	0,26
1968	0,36	0,27	0,51	0,45	0,15	0,51	0,60	0,45	0,21	0,21	0,51	0,54	0,40
1969	0,54	0,27	-	0,60	0,24	0,21	0,30	0,15	0,09	0,09	0,24	0,33	0,28
1970	0,45	0,48	0,51	0,45	0,45	0,27	0,21	0,27	0,21	0,09	0,39	0,60	0,37
1971	0,60	0,52	0,36	0,39	0,60	0,36	0,30	0,33	0,21	0,21	0,30	0,66	0,40
1972	0,63	0,30	0,48	0,39	0,24	0,18	0,21	0,24	0,12	-	0,45	0,48	0,34
1973	0,51	0,45	0,60	0,60	-	0,36	0,33	0,30	0,30	0,33	0,45	0,60	0,44
1974	0,45	0,60	0,60	0,60	-	0,30	0,30	0,30	0,42	0,60	0,60	0,60	0,49
1975	0,60	0,60	0,60	0,60	0,54	0,45	0,36	0,30	0,45	0,45	0,60	0,60	0,51
Mean	0,49	0,42	0,46	0,50	0,36	0,31	0,29	0,28	0,23	0,28	0,40	0,53	0,38

Table 2.3.3 K. Sawur (Seksi Sragen)

Unit : l/sec/ha.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1965	0,60	0,60	0,60	0,30	0,27	0,12	0,12	0,21	0,30	0,45	0,60	-	0,38
1966	-	-	0,60	0,36	0,45	0,36	0,30	0,30	0,30	-	0,24	0,36	0,42
1967	-	0,54	0,42	0,42	0,24	0,15	0,15	0,15	0,12	0,12	0,42	0,60	0,30
1968	0,33	0,39	0,45	0,39	0,36	0,39	0,48	0,39	0,33	0,39	-	0,45	0,41
1969	0,42	0,48	0,60	0,45	0,60	-	0,30	0,24	0,12	0,39	0,33	0,30	0,42
1970	0,39	0,39	0,45	0,42	0,60	0,45	0,39	0,24	0,30	0,09	0,33	0,30	0,36
1971	0,36	0,39	0,36	0,30	0,30	0,30	0,30	0,30	0,33	0,60	-	0,51	0,41
1972	0,30	0,30	0,33	0,39	0,36	0,30	0,18	0,18	0,18	0,18	0,18	0,21	0,26
1973	0,36	0,33	0,33	0,36	0,60	0,72	0,66	-	0,45	0,30	0,27	0,30	0,47
1974	0,33	-	0,48	0,54	0,60	0,39	0,36	-	-	0,36	0,30	0,30	0,49
1975	0,42	0,45	0,48	0,48	0,60	0,51	0,60	0,51	0,30	-	0,39	0,33	0,46
Mean	0,39	0,46	0,46	0,40	0,45	0,37	0,35	0,28	0,33	0,35	0,41	0,37	0,40

Table 2.3.4 K. Djlanprang (Seksi Sragen)

Unit : l/sec/ha.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1965	0,42	0,30	0,30	0,21	0,18	0,18	0,21	0,09	0,09	0,15	0,22	-	0,21
1966	-	0,57	0,36	0,48	0,60	0,40	0,12	0,18	0,09	-	-	0,27	0,35
1967	-	0,30	0,13	0,18	0,30	0,18	0,18	0,15	0,12	0,12	-	0,60	0,23
1968	0,33	0,60	0,36	0,33	0,33	0,90	0,66	0,57	0,60	0,45	0,36	0,45	0,50
1969	0,51	0,39	0,39	0,45	0,33	0,72	0,30	0,48	0,24	0,30	0,36	0,39	0,36
1970	0,42	0,42	0,42	0,45	0,66	0,48	0,42	0,27	0,48	0,51	0,63	0,45	0,47
1971	0,39	0,60	0,39	0,36	0,42	0,48	0,48	0,42	0,36	0,45	0,30	0,42	0,42
1972	0,30	0,60	0,45	0,48	0,33	0,27	0,27	0,27	0,21	0,24	0,30	0,33	0,34
1973	0,60	0,63	0,12	0,69	0,66	0,60	0,54	0,45	0,90	0,60	0,60	0,60	0,58
1974	0,60	-	0,63	0,60	0,63	0,60	0,60	0,72	0,60	0,60	0,60	0,66	0,62
1975	0,60	0,66	0,69	0,66	0,63	0,78	0,90	0,66	0,66	-	0,66	0,36	0,66
Mean	0,41	0,51	0,39	0,44	0,46	0,52	0,43	0,39	0,40	0,38	0,45	0,45	0,43

Table 2.3.5 K. Sragen (Seksi Sragen)

Unit : l/sec/ha.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1965	0,45	0,30	0,30	0,30	0,27	0,30	0,15	-	-	0,15	0,45	-	0,33
1966	-	0,36	0,45	0,30	0,42	0,18	0,45	0,21	-	0,24	-	-	0,37
1967	-	0,30	0,15	0,54	0,39	0,21	0,18	0,42	0,18	0,27	0,51	0,48	0,33
1968	0,36	0,30	0,27	0,39	0,75	0,79	0,97	0,93	0,99	0,42	0,39	0,57	0,59
1969	0,45	0,39	0,45	-	0,48	0,57	0,54	0,39	0,39	0,36	0,48	0,42	0,47
1970	0,36	0,45	0,39	0,48	0,60	0,63	0,39	0,30	0,30	0,42	0,18	0,36	0,41
1971	0,42	0,42	0,45	0,57	0,57	0,63	0,48	0,63	0,48	0,48	0,24	0,27	0,47
1972	0,27	0,30	0,33	0,48	0,42	0,18	0,30	0,30	0,27	0,21	0,39	0,24	0,31
1973	0,60	0,42	0,48	0,54	0,72	0,57	0,48	0,39	-	0,18	0,30	0,42	0,46
1974	0,33	-	0,48	0,69	0,60	0,54	0,78	-	0,51	0,45	0,45	0,45	0,53
1975	0,63	0,33	0,51	0,69	0,63	0,69	0,69	0,39	0,63	-	0,57	0,45	0,56
Mean	0,43	0,36	0,39	0,52	0,53	0,48	0,48	0,44	0,47	0,32	0,40	0,41	0,44

Data - 2.4 Record of Measurement for Existing Water Balance

	BLOCK I	BLOCK II	BLOCK III
Date	21 - Feb. - 1976	27 - Mar. - 1976	27 - Mar. - 1976
Location	KMT. Tjonden Seksi Karanganyar	KMT. Sukoharjo Seksi Karanganyar	KMT. Sukoharjo Seksi Karanganyar
Water source	K. Bibis (B. Palur)	Wd. Mulur	Wd. Mulur
Irrigated Area	22 ha	28 ha	29 ha
Inflow discharge	0.127 m^3/sec	0.0296 m^3/sec	0.0363 m^3/sec
Outflow discharge	0.054 m^3/sec	-	-
Water Balance	0.073 m^3/sec	0.0296 m^3/sec	0.0363 m^3/sec
Unit discharge	3.32 l/sec/ha	1.06 l/sec/ha	1.25 l/sec/ha
Rotation interval	Uncertainty	5 days continue 5 days stop	5 days continue 5 days stop
Unit Water Use	-	0.53 l/sec/ha	0.63 l/sec/ha

Data - 2.5 Basic Water Distribution in Dry Season by Traditional Method

DASAR PEMB AGIAN AIR DALAM MUSIM KEMARAU
DIBERIKAN SELAMA 24 JAM TERUS MENERUS
PERBADINGAN SEBAGAIBERIKUT :

No.	Tanaman	Perbandingan	Pasten 4 dt	Kebutuan airl/dt	Keterangan
1	Tanaman palowijo	1	0.15	0.15	
2	Tanaman Tebu	2		0.30	
3	Tanaman padi gadu	3		0.45	
4	garap polo wijo	2		0.30	
5	garap tebu	4		0.60	
6	" padi gadu	5		0.75	
7	Bibit padi gadu	2		0.30	
8	" Tebu	4		0.60	

Pasten Air rata rata tiap-tiap Seksi sebagai berikut =

a. Seksi Klaten
b. Seksi Karanganyar
c. Seksi Sragen
d. Seksi Wanagiri

Rata rata WILAYAH = 015
Perhitungan kebutuan. air tiap-tiap 1.ha. dari mulai bibit sampai datang panen (umur 5,50 bl).

Percobaan

1.	garap tanah/bibit	=	0.751/dt	x	45hr	x	60	x	60	x	24	= 2,916,000
2.	Padi tanam.	=	0.60 "	x	15 "	x	60	x	60	x	24	= 777,600
3.	Pemeliharaan tanam	=	0.45 "	x	30 "	x	60	x	60	x	24	= 1,166,400
4.	Padi meteng	=	0.60 "	x	30 "	x	60	x	60	x	24	= 1,555,200
5.	" berisi	=	0.75 "	x	25 "	x	60	x	60	x	24	= 1,620,000
6.	" kuning	=	0.30 "	x	15 "	x	60	x	60	x	24	= 388,800
7.	" tua	=	0.15 "	x	15 "	x	60	x	60	x	24	= 194,400
	JUMLAH											= 8,628,400

Data-3. EXISTING IRRIGATION FACILITIES

Data - 3.1 Existing Reservoirs

No.	Name of reservoir	Location	Constructed year	Storage capacity /1			Reservoir area	Catchment area	Irrigation area		Remarks
				Design	Present	Sediment-ation			Rainy season	Dry season	
1	M u l u r	Seksi Karanganyar	1921	$10^3 m^3$ 4,935.0	$10^3 m^3$ 3,435.0	$10^3 m^3$ 1,500.0	ha 100.0	km^2 50.0	ha 4,028.0	ha 1,530.0	
2	Lalung	Seksi Karanganyar	1944	3,000.0 (5,000.0)	3,000.0 (5,000.0)	0	65.0	27.0	2,183.0 (5,677.0)	1,643.0	(under extension)
3	T e w e l	Seksi Sragen	1912	79.5	4.5	75.0	3.4	6.1	275.0	71.0	
4	Kebangan	Seksi Sragen	1939	500.0	350.0	150.0	13.0	7.3	1,947.0	1,235.0	
5	Gebyar	Seksi Sragen	1942	701.3	601.3	100.0	10.0	15.0	1,727.0	420.0	
6	Brambang	Seksi Sragen	1912	103.6	93.6	10.0	4.0	6.6	709.0	185.0	
	T o t a l								10,869.0	5,084.0	(47 %)

Data source : Seksi Irrigation Offices (Karanganyar, Sragen)

/1 : Not actual survey (Data source : Master plan)

Data-3.2 Diversion Weirs on Tributaries

No.	Name of diversion weir	Name of tributary	Irrigation area (ha)		Remarks
			Rainy season	Dry season	
1	B. Ambil-ambil	K. Ambil-ambil	223	0	
2	B. Geneng	K. Jlantah	760	219	
3	B. Pepen	K. Jlantah	4,028	1,530	
4	B. Langsur	K. Nglangsur	(374)	(50)	WD. Mulur
5	B. Dari	K. Kumet	331	30	
6	B. Kaliduren	K. Bening	570	170	
7	B. Gembong	K. Gembong	2,137	990	
8	B. Trani	K. Samin			
9	B. Pancuran	K. Cabak	34	0	
10	B. Karanng	K. Cabak			
11	B. Palur	K. Bibis	45	45	
12	B. Jumok	K. Gandu	225	144	
13	B. Dukuh	K. Gandu	283	184	
14	B. Kalongan	K. Wulun	1,427	1,316	
15	B. Jongkang	K. Gabahan	583	284	
16	B. Kebak	Afvur Siwawh	210	129	
17	B. Lungge	Afvur Siwawh	177	145	
18	B. Pengin	K. Tempuran	891	482	
19	B. Ledok	K. Grompol	204	64	
20	B. Banjarsari	K. Grompol	460	187	
21	B. Craken	K. Craken	208	67	
22	B. Kedunggatot	K. Karang	2,033	599	
23	B. Kedunggawe	K. Jambangan			
24	B. Knhil	Afvur Prampalan			
25	B. Gebang	K. Mungkung	459	162	
26	B. Bonggo	K. Tempuran	488	163	
27	B. Sepreh	K. Sragen	253	80	
28	B. Karas	K. Sragen	124	31	
29	B. Krapyak	K. Sragen	314	103	
30	B. Randu	K. Ngrandu	256	121	
31	B. Maron	K. Ngrandu	74	27	
32	B. Ngarum	K. Ngarum	603	218	
33	B. Klenteng	K. Ngampanan	938	311	
34	B. Kedungseng	K. Bojuz	212	53	
35	B. Nangsri	K. Karang	1,344	361	
36	B. Kedungduren	K. Sawar	758	145	
37	B. Wineng	K. Sawar			
38	B. Piji	K. Sawar	1,739	599	
	Sub-total		18,313	7,429	
1	B. Garotan	K. Paijinan	319	0	
2	B. Jatimalang	K. Dawung	235	0	
3	B. Pencit	K. Dengkeng	250	0	
	Sub-total		804	0	
	T o t a l		19,117	7,429	(39 %)
			Paddy	4,265	(22 %)
			sugar cane	3,164	(17 %)

Data source : Seksi Irrigation Office.

Data - 3.3 Existing Pumps

No.	Name of pumps	Water source	Capacity (m3/sec).	Power (P.S.).	Irrigation area (ha).
1	Mlale	Bengawan Solo	0.040	16	50
2	Kalibening	Kali Bening	0.015	30	---
3	Plosorejo	Plosorejo	0.030	16	90
4	Kauman	K. Jlamprang	0.010	8	20
5	S o g o	K. S o g o	0.010	8	25
6	Murong I	K. Kenatan	0.030	16	--
7	Murong II	K. Kenatan	0.025	15	200
8	Kaponan I	K. Gebang	0.023	16	40
9	Kaponan II	K. Gebang	0.035	20	50
10	Ngagol I	B. Solo	0.016	8	25
11	Ngagol II	B. Solo	0.016	8	25
12	Tenggak	B. Solo	0.040	16	50
13	Glonggong	Bend. Craken	0.045	16	25
14	Sribit	B. Solo	0.035	16	60
15	Gebang I	K. Jlamprang	0.015	16	25
16	Gebang II	K. Jlamprang	0.020	20	30
17	Bedoro	K. Kenatan	0.020	7	30
	Sub-total (Sragen)	17 sites	0.425		745
18	Parangjoho	B. Solo	0.070	27	100
19	Kriwen	B. Solo	0.150	50	420
20	J o h o	Afyoer	0.015	1	15
21	W a r u	K. Guworejo	0.016	15	16
22	Sidodadi	K. Grompol	0.050	47	101
23	Kebak	Bend, Kebak	0.016	15	20
24	Pulosari I	K. Manggis	0.015	15	20
25	Kemiri	S r o y o	0.016	15	17
26	Nangsri	K. Banaran	0.016	15	16
27	Pulosari II	K. Jelok	0.015	15	20
28	J a t e n	K. B u l u	0.030	30	36
	Sub-total (Karanganyar)	11 sites	0.409		761
	T o t a l	28 sites	0.834		1,506

Data source : Master plan (D.P.U. Offices)

Data-4. CALCULATION OF IRRIGATION WATER REQUIREMENTS IN 1961/1962

Data-4.1 Effective Rainfall (1961/1962)

unit: mm/day

Month	Ten Day Period	Karanganyar		Sragen		Dengkeng	
		For Paddy	For Sugar Polowijo	For Paddy	For Sugar Polowijo	For Paddy	For Polo Wijo
	1	2.0	2.8	0.8	1.1	1.4	2.1
A	2	9.0	7.0	4.4	7.0	12.0	7.0
	3	6.6	7.0	3.8	5.2	7.2	7.0
	1	5.2	6.7	7.1	9.6	7.6	7.0
M	2	1.5	2.0	1.6	2.1	1.8	2.2
	3	-	-	-	-	-	-
	1	-	-	2.3	2.8	-	-
J	2	6	-	-	-	-	-
	3	-	6	-	-	-	-
	1	-	-	-	1	-	-
J	2	1.3	2.4	-	2	3.2	4.0
	3	-	-	-	-	-	-
	1	-	-	-	-	-	-
A	2	-	-	-	-	-	-
	3	-	-	-	-	-	-
	1	-	-	-	-	-	-
S	2	-	-	5	6	-	-
	3	-	-	-	-	-	-
	1	2	3	-	1	-	0.3
O	2	-	-	-	1	-	-
	3	4.3	6.0	1.4	2.3	5.3	6.6
	1	6.1	7.0	8.4	7.0	3.7	4.6
N	2	5.3	7.0	7.3	7.0	5.0	6.7
	3	3.1	4.0	4.3	5.4	4.5	5.6
	1	4.2	7.0	4.8	7.0	7.4	7.0
D	2	10.3	7.0	8.3	7.0	9.4	7.0
	3	6.8	7.0	3.3	4.3	3.9	5.4
	1	12.1	7.0	14.0	7.0	16.4	7.0
J	2	9.5	7.0	9.2	7.0	7.5	7.0
	3	9.1	7.0	4.3	6.0	5.1	6.8
	1	8.7	7.0	4.8	7.0	8.9	7.0
F	2	9.7	7.0	7.7	7.0	5.7	7.0
	3	6.1	7.0	3.1	4.4	6.5	7.0
	1	3.2	4.3	2.6	3.7	4.5	5.6
M	2	5.6	7.0	4.1	5.3	5.0	7.0
	3	13.1	7.0	11.5	7.0	12.2	7.0
Total		1,436mm	1,341mm	1,196mm	1,233mm	1,447mm	1,339mm

Data-4.2.1 Unit Irrigation Requirement / Paddy / Karanganyar Region

ALT-1 unit: mm/day

Month	Ten Day Period	(1) Evaporation	(2) Crop Coefficient	(3) Evapotranspiration (1) x (2)	(4) Percolation	(5) Water requirement (3)+(4)	(6) Farm waste (5) x 0.1 or 0.05	(7) Effective rainfall	(8) Unit irrigation requirement (5)+(6)-7
	1		0.87	4.00		5.00	0.50	2.0	3.5
A	2	4.6	0.77	3.54	1.0	4.54	0.50	9.0	-
	3		0.74	3.40		4.40	0.44	6.6	-
	1		0.80	4.08		5.53	0.29	5.2	0.6
M	2	5.1	1.00	5.10	1.5	6.00	0.30	1.5	4.8
	3		1.05	5.36		6.86	0.34	-	7.2
	1		1.08	6.37		7.87	0.39	-	8.3
J	2	5.9	1.12	6.61	1.5	8.11	0.41	0.6	7.9
	3		1.14	6.73		8.23	0.41	-	8.6
	1		1.20	7.68		9.18	0.46	-	9.6
J	2	6.4	1.23	7.87	1.5	9.37	0.47	1.3	8.5
	3		1.24	7.94		9.44	0.47	-	9.9
	1		1.21	8.71		10.21	0.51	-	10.7
A	2	7.2	1.15	8.28	1.5	9.78	0.49	-	10.3
	3		1.04	7.49		8.99	0.45	-	9.4
	1		1.00	8.00		9.50	0.48	-	10.0
S	2	8.0	0.94	7.52	1.5	9.02	0.45	-	9.5
	3		0.87	6.96		8.46	0.42	-	8.9
	1		0.77	5.24		6.74	0.34	0.2	6.9
O	2	6.8	0.66	4.49	1.5	5.99	0.30	-	6.3
	3		0.50	3.40		4.90	0.25	4.3	0.9
	1		0.91	5.01		6.01	0.60	6.1	0.5
N	2	5.5	0.96	5.28	1.0	6.28	0.63	5.3	1.6
	3		1.00	5.50		6.50	0.65	3.1	4.1
	1		1.05	4.52		5.52	0.55	4.2	1.9
D	2	4.3	1.08	4.64	1.0	5.64	0.58	10.3	-
	3		1.12	4.82		5.82	0.58	6.8	-
	1		1.14	4.22		5.22	0.52	12.1	-
J	2	3.7	1.20	4.44	1.0	5.44	0.54	9.5	-
	3	1.23	4.55	4.55		5.55	0.56	9.1	-
	1		1.24	4.46		5.46	0.55	8.7	-
F	2	3.6	1.21	4.36	1.0	5.36	0.54	9.7	-
	3		1.15	4.14		5.14	0.51	6.1	0.5
	1		1.04	4.06		5.06	0.50	3.2	2.4
M	2	3.9	1.00	3.90	1.0	4.90	0.49	5.6	-
	3		0.94	3.67	-	4.67	0.47	13.1	-

Data-4.2.2 Unit Irrigation Requirement / Second cropping / Karanganyar Region
paddy

ALT-1 unit: mm/day

Month	Ten Day Period	(1) Evaporation	(2) Crop Coefficient	(3) Evapotranspiration (1) x (2)	(4) Percolation	(5) Water requirement (3)+(4)	(6) Farm waste (5)x 0.10 or 0.05	(7) Effective rainfall	(8) Unit irrigation requirement (5)+(6)-7
	1							2.0	-
A	2	4.6	-	-	1.0	-	-	9.0	-
	3							6.6	-
	1							5.2	-
M	2	5.1	-	-	1.5	-	-	1.5	-
	3							-	-
	1							-	-
J	2	5.9	-	-	1.5	-	-	0.6	-
	3							-	-
	1							-	-
J	2	6.4	-	-	1.5	-	-	1.3	-
	3							-	-
	1							-	-
A	2	7.2	-	-	1.5	-	-	-	-
	3							-	-
	1		-	-		-	-	-	-
S	2	8.0	0.91	7.28	1.5	8.78	0.49	-	9.2
	3		0.96	7.68		9.18	0.46	-	9.6
	1		1.00	6.80		8.30	0.42	0.2	8.5
O	2	6.8	1.05	7.14	1.5	8.54	0.43	-	9.1
	3		1.08	7.34		8.84	0.44	4.3	5.0
	1		1.12	6.16		7.16	0.72	6.1	1.8
N	2	5.5	1.14	6.27	1.0	7.27	0.73	5.3	2.7
	3		1.20	6.60		7.60	2.76	3.1	5.3
	1		1.23	5.29		6.29	0.63	4.2	2.7
D	2	4.3	1.24	5.33	1.0	6.33	0.63	10.3	-
	3		1.21	5.20		6.20	0.62	6.8	-
	1		1.15	4.26		5.26	0.53	12.1	-
J	2	3.7	1.04	3.85	1.0	4.85	0.49	9.5	-
	3		1.00	3.70		4.70	0.47	9.1	-
	1		0.94	3.38		4.38	0.44	8.7	-
F	2	3.6	0.87	3.13	1.0	4.13	0.41	9.7	-
	3		0.77	2.77		3.77	0.38	6.1	-
	1		0.66	2.57		3.57	0.36	3.2	0.7
M	2	3.9	0.50	1.95	1.0	2.95	0.30	5.6	-
	3		-		-		-	13.1	-

Data-4.2.3 Unit irrigation Requirement / Sugar Cane / Karanganyar Region

ALT-1 unit: mm/day

Month	Ten Day Period	(1) Evaporation	(2) Crop Coefficient	(3) Evapotranspiration (1) x (2)	(4) Farm Waste (3)x0.10 or 0.05	(5) Effective rainfull	(6) Unit Irrigation Requirement (3)+(4)-(5)
	1		0.64	2.94	0.44	2.8	0.6
A	2	4.6	0.60	2.76	0.41	7.0	-
	3		0.58	2.67	0.40	7.0	-
	1		0.58	2.96	0.30	6.7	-
M	2	5.1	0.58	"	0.30	2.0	1.3
	3		0.58	"	0.30	-	3.3
	1		0.59	3.48	0.35	-	3.8
J	2	5.9	0.60	3.54	0.35	-	3.9
	3		0.61	3.60	0.36	0.6	3.4
	1		0.63	4.03	0.40	-	4.4
J	2	6.4	0.66	4.22	0.42	2.4	2.2
	3		0.70	4.48	0.45	-	4.9
	1		0.76	5.47	0.54	-	6.0
A	2	7.2	0.77	5.54	0.53	-	6.1
	3		0.79	5.69	0.57	-	6.3
	1		0.80	6.40	0.64	-	7.0
S	2	8.0	0.81	6.48	0.65	-	7.1
	3		0.82	6.56	0.66	-	7.2
	1		0.83	5.64	0.56	0.3	5.9
O	2	6.8	0.84	5.71	0.57	-	6.3
	3		0.85	5.78	0.58	6.0	0.4
	1		0.86	4.73	0.71	7.0	-
N	2	5.5	0.86	"	0.71	7.0	-
	3		0.86	"	0.71	4.0	1.4
	1		0.86	3.70	0.56	7.0	-
D	2	4.3	0.86	"	0.56	7.0	-
	3		0.86	"	0.56	7.0	-
	1		0.85	3.15	0.47	7.0	-
J	2	3.7	0.84	3.11	0.47	7.0	-
	3		0.83	3.07	0.45	7.0	-
	1		0.81	2.92	0.44	7.0	-
F	2	3.6	0.79	2.84	0.43	7.0	-
	3		0.77	2.77	0.42	7.0	-
	1		0.73	2.85	0.43	4.30	-
M	2	3.9	0.70	2.73	0.41	7.0	-
	3		0.66	2.57	0.39	7.0	-

Data-4.2.4 Unit Irrigation Requirement / Paddy / Sragen Region

AI/T-1

unit: mm/day

Month	Ten Day Period	(1) Evaporation	(2) Crop Coefficient	(3) Evapotranspiration (1) x (2)	(4) Percolation	(5) Water Requirement (3)+(4)	(6) Farm Waste (5)x 0.10 or 0.05	(7) Effective rainfall	(8) Unit Irrigation Requirement (5)+(6)-7
	1		0.87	4.00		5.50	0.50	0.8	5.2
A	2	4.6	0.77	3.54	1.0	4.54	0.45	4.4	0.6
	3		0.74	3.40		4.40	0.44	3.3	1.0
	1		0.80	4.08		5.58	0.28	7.11	-
M	2	5.1	1.00	5.10	1.5	6.60	0.33	1.6	5.3
	3		1.05	5.35		6.85	0.34	-	7.2
	1		1.08	6.37		7.87	0.39	2.3	6.0
J	2	5.9	1.12	6.61	1.5	8.11	0.41	-	8.5
	3		1.14	6.73		8.23	0.41	-	8.6
	1		1.20	7.68		9.18	0.46	-	9.6
J	2	6.4	1.23	7.87	1.5	9.27	0.46	-	9.7
	3		1.24	7.94		9.40	0.47	-	9.9
	1		1.21	8.71		10.21	0.51	-	10.7
A	2	7.2	1.15	8.28	1.5	9.78	0.50	-	10.3
	3		1.04	7.49		8.99	0.45	-	9.4
	1		1.00	8.00		9.50	0.48	-	10.0
S	2	8.0	0.94	7.52	1.5	9.02	-.45	0.5	9.0
	3		0.87	6.96		8.46	0.42	-	8.9
	1		0.77	5.24		6.74	0.34	-	7.1
O	2	6.8	0.66	4.49	1.5	5.99	0.30	-	6.3
	3		0.50	3.40		4.90	0.25	1.4	3.8
	1		0.91	5.01		6.01	0.60	8.4	-
N	2	5.5	0.96	5.28	1.0	6.28	0.63	7.3	-
	3		1.00	5.50		6.50	0.65	4.3	2.9
	1		1.05	4.52		5.52	0.55	4.8	1.3
D	2	4.3	1.08	4.64	1.0	5.64	0.56	8.3	-
	3		1.12	4.82		5.82	0.58	3.3	3.1
	1		1.14	4.22		5.22	0.52	1.40	-
J	2	3.7	1.20	4.44	1.0	5.44	0.54	9.2	-
	3		1.23	4.55		5.55	0.56	4.30	1.8
	1		1.24	4.46		5.46	0.55	4.80	1.2
F	2	3.6	1.21	4.36	1.0	5.36	0.54	7.70	-
	3		1.15	4.14		5.14	0.51	3.10	2.5
	1		1.04	4.06		5.06	0.50	2.60	3.0
M	2	3.9	1.00	3.90	1.0	4.90	0.50	4.00	1.3
	3		0.94	3.67		4.67	6.47	11.50	-

Data-4.2.5 Unit Irrigation Requirement / Second Paddy / Sragen Region

ALT-1 unit : mm/day

Month	Ten Day Period	(1) Evaporation	(2) Crop Coefficient	(3) Evapotranspiration (1) x (2)	(4) Percolation	(5) Water Requirement (3)+(4)	(6) Farm Waste (5)x 0.10 or 0.05	(7) Effective rainfull	(8) Unit Irrigation Requirement (5)+(6)-(7)
A	1	4.6	-	-	1.0	-	-	0.8	
	2							4.4	-
	3							3.8	
M	1	5.1	-	-	1.5	-	-	7.1	
	2							1.6	-
	3							-	
J	1	5.9	-	-	1.5	-	-	2.3	
	2							-	-
	3							-	
J	1	6.4	-	-	1.5	-	-	-	
	2							-	-
	3							-	
A	1	7.2	-	-	1.5	-	-	-	
	2							-	-
	3							-	
S	1	8.0	-	-	1.5	-	-	-	-
	2		0.91	7.28		8.78	0.44	0.5	8.7
	3		0.96	7.68		9.18	0.46	-	9.6
O	1	6.8	1.00	6.80	1.5	8.30	0.83	-	9.1
	2		1.05	7.14		8.64	0.86	-	9.5
	3		1.08	7.34		8.84	0.88	1.4	8.3
N	1	5.5	1.12	6.16	1.0	7.16	0.72	8.4	-
	2		1.14	6.27		7.27	0.73	7.3	0.7
	3		1.20	6.60		7.60	0.76	4.3	4.1
D	1	4.3	1.23	5.29	1.0	6.29	0.63	4.8	2.1
	2		1.24	5.33		6.33	0.63	8.3	-
	3		1.21	5.20		6.20	0.62	3.3	3.5
J	1	3.7	1.15	4.26	1.0	5.26	0.53	1.40	-
	2		1.04	3.85		4.85	0.49	9.2	-
	3		1.00	3.70		3.70	0.47	4.3	0.9
F	1	3.6	0.94	3.38	1.0	4.38	0.44	4.8	-
	2		0.87	3.13		4.13	0.41	7.7	
	3		0.77	2.77		3.77	0.38	3.1	1.1
M	1	3.9	0.66	2.57	1.0	3.57	0.36	2.6	1.3
	2		0.50	1.95		2.95	0.30	4.1	-
	3		-	-		-		11.5	-

Data-4.2.6 Unit Irrigation Requrement / Sugar Cane / Sragen Region

ALT-1 unit : mm/day

Month	Ten Day Period	(1) Evaporation	(2) Crop Coefficient	(3) Evapotrans-piration (1) x (2)	(4) Farm Waste (3)x0.10 or 0.05	(5) Effective rainfall	(6) Unit Irrigation Requirement (3)+(4)-(5)
	1		0.64	2.94	0.44	1.1	2.3
A	2	4.6	0.60	2.76	0.41	7.0	-
	3		0.58	2.67	0.40	5.2	-
	1		0.58	2.96	0.30	9.6	-
M	2	5.1	0.58	2.96	"	2.1	1.2
	3		0.58	2.96	"	-	3.3
	1		0.59	3.48	0.35	2.8	1.0
J	2	5.9	0.60	3.54	"	-	3.9
	3		0.61	3.60	0.36	-	4.0
	1		0.63	4.03	0.40	0.1	4.3
J	2	6.4	0.66	4.22	0.42	0.2	4.4
	3		0.70	4.48	0.45	-	4.9
	1		0.76	5.47	0.54	-	6.0
A	2	7.2	0.77	5.54	0.53	-	6.1
	3		0.79	5.69	0.57	-	6.3
	1		0.80	6.40	0.64	-	7.0
S	2	8.0	0.81	6.48	0.65	0.6	6.5
	3		0.82	6.56	0.66	-	7.2
	1		0.83	5.64	0.56	2.1	6.1
O	2	6.8	0.84	5.71	0.57	0.1	6.2
	3		0.85	5.78	0.58	2.3	4.1
	1		0.86	4.73	0.71	7.0	-
N	2	5.5	0.86	4.73	"	7.0	-
	3		0.86	4.73	"	5.4	-
	1		0.86	3.70	0.56	7.0	-
D	2	4.3	0.86	"	"	7.0	-
	3		0.86	"	"	4.3	-
	1		0.85	3.15	0.47	7.0	-
J	2	3.7	0.84	3.11	"	7.0	-
	3		0.83	3.07	0.45	6.0	-
	1		0.81	2.92	0.44	7.0	-
F	2	3.6	0.79	2.89	0.43	7.0	-
	3		0.77	2.77	0.42	4.4	-
	1		0.73	2.85	0.43	3.7	
M	2	3.9	0.70	2.73	0.41	5.3	-
	3		0.66	2.57	0.39	7.0	-

Data-4.2.7 Unit Irrigation Requirement / Paddy / Dengkeng Region

ALT-1 unit : mm/day

Month	Ten Day Period	(1) Evaporation	(2) Crop Coefficient	(3) Evapotranspiration (1) x (2)	(4) Percolation	(5) Water Requirement (3)+(4)	(6) Farm Waste (5)x 0.10 or 0.05	(7) Effective rainfall	(8) Unit Irrigation Requirement (5)+(6)-(7)
	1		0.87	4.00		5.00	0.55	1.4	4.2
A	2	4.6	0.77	3.54	1.0	4.54	0.50	12.5	-
	3		0.74	3.40		4.40	0.44	7.2	-
	1		0.80	4.08		5.58	0.28	7.6	-
M	2	5.1	1.00	5.10	1.5	6.00	0.30	1.8	4.5
	3		1.05	5.36		6.86	0.34	-	7.2
	1		1.08	6.37		7.87	0.39	-	8.3
J	2	5.9		1.12	6.61	1.5	8.11	0.41	8.5
	3		1.14	6.73		8.23	0.41	-	8.6
	1		1.20	7.68		9.28	0.46	-	9.6
J	2	6.4	1.23	7.87	1.5	9.37	0.47	3.2	6.6
	3		1.24	7.94		9.44	0.47	-	9.9
	1		1.21	8.71		10.21	0.51	-	10.7
A	2	7.2	1.15	8.28	1.5	9.78	0.49	-	10.3
	3		1.04	7.49		8.97	0.45	-	9.4
	1		1.00	8.00		9.50	0.48	-	10.0
S	2	8.0	0.94	1.52	1.5	9.02	0.45	-	9.5
	3		0.87	6.16		8.46	0.42	-	8.9
	1		0.77	5.24		6.74	0.34	-	7.1
O	2	6.8	0.66	4.49	1.5	5.99	0.30	-	6.3
	3		0.50	3.40		4.90	0.25	5.3	-
	1		0.91	5.01		6.01	0.60	3.7	2.9
N	2	5.5	0.96	5.28	1.0	6.28	0.63	5.0	1.9
	3		1.00	5.50		6.50	0.65	4.5	2.7
	1		1.05	4.52		5.52	0.55	7.4	-
D	2	4.3	1.08	4.64	1.0	5.64	0.56	9.4	-
	3		1.12	4.82		5.82	0.58	3.9	2.5
	1		1.14	9.22		5.22	0.52	16.4	-
J	2	3.7	1.20	4.44	1.0	5.44	0.54	7.5	-
	3		1.23	4.55		5.55	0.56	5.1	1.0
	1		1.24	4.46		5.46	0.55	8.9	-
F	2	3.6	1.21	4.36	1.0	5.36	0.54	5.7	0.2
	3		1.15	4.14		5.14	0.51	6.5	-
	1		1.04	4.06		5.06	0.50	4.5	1.1
M	2	3.9	1.00	3.90	1.0	4.90	0.49	5.0	0.4
	3		0.94	3.67		4.67	0.47	12.2	-

Data 4.2.8 Irrigation Requirement & Diversion Requirement / Paddy (8900 ha) / Karanganyan Region

ALT-1

Month	Puddling Requirement for nursely (mm)	Puddling Requirement for transplanting (mm)	Unit Irrigation Requirement (mm/day)	Hecterage to Supplied Water: Nursery Puddling (ha)	Hecterage to Supplied Water: Transplanting Puddling (ha)	Hecterage to Supplied Water: On Grawing Stage (ha)	Irrigation Requirement (m3/day)	Irrigation Requirement (m3/day)	Conveyance Losses (m3/sec.)	Diversion Requirement (m3/sec.)	Remarks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
	-	-	3.5	-	-	5.189	181,615	2.102	0.527	2.628	
Apr.	-	-	-	-	-	3.711	-	-	-	-	
	100	-	-	7.4	-	2.252	7.400	0.086	0.021	0.107	
	150		0.6	7.4	-	846	16,176	0.187	0.047	0.234	
May	150	200	4.8	7.4	71	2.025	166,780	1.930	0.483	2.413	
	150	200	7.2	7.4	151	1.513	422,036	4.885	1.221	6.106	
	150	200	8.3	7.4	151	2.999	562.017	6.505	1.626	8.131	
June	150	200	7.9	7.4	151	4.477	666,783	7.717	1.930	9.647	
	-	200	8.6	-	151	5.936	812.496	9.404	2.351	11.755	
	-	200	9.6	-	151	7.343	1,006,928	11.654	2.914	14.568	
Jul.	-	200	8.5	-	71	8.651	877.335	10.154	2.539	12.693	
	-	-	9.9	-	-	8.900	881.100	10.198	2.551	12.749	
	-	-	10.7	-	-	8.900	952.300	11.022	2.755	13.777	
Aug.	-	-	10.3	-	-	8.900	916.700	10.610	2.652	13.262	
	-	-	9.4	-	-	8.900	836,600	9.683	2.421	12.104	
	-	-	10.0	-	-	8.161	816,100	9.446	2.361	11.807	
Sep.	-	-	9.5	-	-	6.675	634.125	7.339	1.835	9.174	
	-	-	8.9	-	-	5.189	461,821	5.345	1.336	6.681	
	-	-	6.9	-	-	3.711	256.059	2.964	0.741	3.705	
Oct.	-	-	6.3	-	-	2.225	140,175	1.622	0.406	2.028	
	-	-	0.9	-	-	739	6,651	0.077	0.019	0.096	
	100	-	0.5	7.4	-	27	7,535	0.087	0.022	0.109	
Nov.	100	-	1.6	7.4	-	107	9,112	0.105	0.237	0.132	
	100	150	4.1	7.4	71	2.025	125.585	1.454	0.363	1.817	
	100	150	1.9	7.4	151	1.513	262,647	3.040	0.760	3.800	
Dec.	100	150	-	7.4	151	2.999	233.900	2.707	0.677	3.384	
	100	150	-	7.4	151	4.477	233,900	2.707	0.677	3.384	
	-	150	-	-	151	5.936	226.500	2.622	0.655	3.277	
Jan.	-	150	-	-	151	7.343	226,500	2.622	0.655	3.277	
	-	150	-	-	71	0.651	106,500	1.234	0.307	1.541	
	-	-	-	-	-	8.900	-	-	-	-	
Feb.	-	-	-	-	-	8.900	-	-	-	-	
	-	-	0.5	-	-	8.900	44,500	0.515	0.129	0.644	
	-	-	2.4	-	-	8.900	213,600	2.472	0.618	3.090	
Mar.	-	-	-	-	-	8.161	-	-	-	-	
	-	-	-	-	-	6.675	-	-	-	-	

Note : Conveyance losses of 25% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, and irrigal diversion etc.

Calculating process; ((1) x (4) + (2) x (5) + (3) x (6)) x 10 = (7)

(7)186,400 (8), (8) + (9) = (10)

Data 4.2.9 Irrigation Requirement & Diversion Requirement / Secondary Cropping / Karanganyar Region

ALT-1

Month	Puddling Requirement for nursery (mm)	Puddling Requirement for transplanting (mm)	Unit Irrigation Requirement mm/day	Hectorage to Supplied Water: Nursery Puddling ha	Hectorage to Supplied Water: Transplanting Puddling ha	Hectorage to Supplied Water: On Growing Stage ha	Irrigation Requirement m3/day	Irrigation Requirement m3/day	Conveyance Losses m3/sec.	Diversion Requirement m3/sec.	Remarks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
	–	–	–	–	–	–	–	–	–	–	
Apr.	–	–	–	–	–	–	–	–	–	–	
	–	–	–	–	–	–	–	–	–	–	
	–	–	–	–	–	–	–	–	–	–	
May	–	–	–	–	–	–	–	–	–	–	
	–	–	–	–	–	–	–	–	–	–	
	–	–	–	–	–	–	–	–	–	–	
June	–	–	–	–	–	–	–	–	–	–	
	–	–	–	–	–	–	–	–	–	–	
	–	–	–	–	–	–	–	–	–	–	
Jul.	–	–	–	–	–	–	–	–	–	–	
	–	–	–	–	–	–	–	–	–	–	
	–	–	–	–	–	–	–	–	–	–	
Aug.	–	–	–	–	–	–	–	–	–	–	
	–	–	–	–	–	–	–	–	–	–	
	–	–	–	–	–	–	–	–	–	–	
Sep.	150	–	9.2	0.50	–	2	934	0.011	0.003	0.014	
	150	–	9.6	0.50	–	7	1,422	0.016	0.005	0.021	
	150	200	8.5	0.50	5	19	12,365	0.143	0.036	0.179	
Oct.	150	200	9.1	0.50	10	102	30,032	0.348	0.086	0.434	
	150	200	5.0	0.50	10	202	30,850	0.357	0.089	0.446	
	100	150	1.8	0.50	10	302	20,936	0.242	0.061	0.303	
Nov.	–	150	2.7	–	10	400	25,800	0.299	0.074	0.373	
	–	150	5.3	–	10	495	41,235	0.477	0.120	0.597	
	–	150	2.7	–	5	583	23,241	0.269	0.067	0.336	
Dec.	–	–	–	–	–	600	–	–	–	–	
	–	–	–	–	–	600	–	–	–	–	
	–	–	–	–	–	600	–	–	–	–	
Jan.	–	–	–	–	–	600	–	–	–	–	
	–	–	–	–	–	550	–	–	–	–	
	–	–	–	–	–	450	–	–	–	–	
Peb.	–	–	–	–	–	550	–	–	–	–	
	–	–	–	–	–	450	–	–	–	–	
	–	–	0.7	–	–	150	1,050	0.012	0.003	0.015	
Mar.	–	–	–	–	–	50	–	–	–	–	
	–	–	–	–	–	–	–	–	–	–	

Note: Conveyance losses of 25% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, and irrigal diversion etc.

Calculating process; ((1) x (4) + (2) x (5) + (3) x (6)) x 10 = (7)

(7)/86.400 (8), (8) + (9) = (10)

Data-4.2.10 Irrigation Requirement & Diversion Requirement / Sugar Cane (600 ha x 2) / Karanganyar Region

ALT-I

Month	Puddling Requirement: for nursery (mm) (1)	Puddling Requirement: for transplanting (mm) (2)	Unit Irrigation Requirement (mm/day) (3)	Hectarage to Supplied Water: Nursery Puddling (ha) (4)	Hectarage to Supplied Water: Transplanting Puddling (ha) (5)	Hectarage to Supplied Water: On Grawing Stage (ha) (6)	Irrigation Requirement (m3/day) (7)	Irrigation Requirement (m3/day) (8)	Conveyance Losses (m3/sec.) (9)	Diversion Requirement (m3/sec.) (10)	Remarks
Apr.			0.6			833	4,998	0.058	0.014	0.072	
			–			900	–	–	–	–	
			–			967	–	–	–	–	
May			–			999	–	–	–	–	
			1.3			1,000	13,000	0.150	0.038	0.188	
			3.3			999	32,967	0.382	0.095	0.477	
June			3.8			900	34,200	0.396	0.099	0.495	
			3.9			833	32,487	0.376	0.094	0.470	
			3.4			767	26,078	0.302	0.075	0.377	
Jul.			4.4			700	30,800	0.356	0.089	0.445	
			2.2			634	13,948	0.161	0.041	0.202	
			4.9			600	29,400	0.340	0.085	0.425	
Aug.			6.0			600	36,000	0.417	0.104	0.521	
			6.1			"	36,600	0.424	0.106	0.530	
			6.3			"	37,800	0.438	0.109	0.547	
Sep.			7.0			"	42,000	0.486	0.122	0.608	
			7.1			"	42,600	0.493	0.123	0.616	
			7.2			"	43,200	0.500	0.125	0.625	
Oct.			5.9			"	35,400	0.410	0.102	0.512	
			6.3			"	37,600	0.438	0.109	0.547	
			6.4			"	2,400	0.028	0.007	0.035	
Nov.			–			"	–	–	–	–	
			–			"	–	–	–	–	
			1.4			"	8,400	0.097	0.025	0.122	
Dec.			–			"	–	–	–	–	
			–			"	–	–	–	–	
			–			"	–	–	–	–	
Jan.			–			"	–	–	–	–	
			–			"	–	–	–	–	
			–			"	–	–	–	–	
Feb.			–			"	–	–	–	–	
			–			""	–	–	–	–	
			–			"	–	–	–	–	
Mar.			–			634	–	–	–	–	
			–			700	–	–	–	–	
			–			704	–	–	–	–	

Note: Conveyance losses of 25% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, and irrigal diversion etc.

Calculatint process; (1) x (2) x 10 = (3) (3)/86,400 = (4) (4) + (5) = (6)

Data-4.2.11 Irrigation Requirement & Diversion Requirement / Paddy (6500 ha) / Sragen Region

ALT-1

Month	Puddling Requirement for nursery (mm)	Puddling Requirement for transplanting (mm)	Unit Irrigation Requirement (mm/day)	Hecterage to Supplied Water: Nursery Puddling (ha)	Hecterage to Supplied Water: Transplanting Puddling (ha)	Hecterage to Supplied Water: On Growing Stage (ha)	Irrigation Requirement (m3/day)	Irrigation Requirement (m3/day)	Conveyance Losses (m3/sec.)	Diversion Requirement (m3/sec.)	Remarks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
	-	-	5.2	-	-	3,790	197,080	2. 81	0.798	3.079	
Apr.	-	-	0.6	-	-	2,711	16,266	0.188	0.063	0.254	
	100	-	1.0	5.4	-	1,645	21,850	0.253	0.088	0.341	
	150	-	-	5.4	-	618	8,100	0.094	0.032	0.126	
May	150	200	5.3	5.4	52	208	123,124	1.425	0.499	1.924	
	150	200	7.2	5.4	111	1,105	309,660	3.584	1.254	4.838	
	150	200	6.0	5.4	111	2,191	361,560	4.184	1.465	5.649	
June	150	200	8.5	5.4	111	3,270	508,050	5.880	2.058	7.938	
	-	200	8.6	-	111	4,334	594,896	6.885	2.410	9.295	
	-	200	9.6	-	111	5,363	736,848	8.528	2.985	11.513	
Jul.	-	200	9.7	-	52	6,318	716,846	8.297	2.904	11.201	
	-	-	9.9	-	-	6,500	643,500	7.448	2.607	10.055	
	-	-	10.7	-	-	"	695,500	8.050	2.817	10.867	
Aug.	-	-	10.3	-	-	"	669,500	7.749	2.712	10.461	
	-	-	9.4	-	-	"	611,000	7.072	2.475	9.547	
	-	-	10.0	-	-	5,961	596,100	6.899	2.415	9.314	
Sep.	-	-	9.0	-	-	4,875	438,750	5.078	1.777	6.855	
	-	-	8.9	-	-	3,790	337,310	3.904	1.366	5.270	
	-	-	7.1	-	-	2,711	192,.81	2.228	0.780	3.008	
Oct.	-	-	6.3	-	-	1,625	102,375	1.185	0.415	1.600	
	-	-	3.8	-	-	540	20,520	0.238	0.083	0.321	
	100	-	-	5.4	-	20	5,400	0.063	0.021	0.084	
Nov.	100	-	-	5.4	-	78	5,400	0.063	0.021	0.084	
	100	150	2.9	5.4	52	208	89,432	1.035	0.362	1.397	
	100	150	1.3	5.4	117	1,105	186,265	2.156	0.754	2.910	
Dec.	100	150	-	5.4	111	2,191	171,900	1.990	0.696	2.686	
	100	150	3.1	5.4	111	3,270	273,270	3.163	1.107	4.270	
	-	150	-	-	111	4,336	166,500	1.927	0.675	2.602	
Jan.	-	150	-	-	111	5,363	166,500	1.927	0.675	2.602	
	-	150	1.8	-	52	6,318	191,724	2.219	0.777	2.996	
	-	-	1.2	-	-	6,500	78,000	0.903	0.316	1.219	
Feb.	-	-	-	-	-	6,500	-	-	-	-	
	-	-	1.5	-	-	6,500	162,500	1.881	0.658	2.539	
	-	-	3.0	-	-	6,500	195,000	2.257	0.790	3.047	
Mar.	-	-	1.3	-	-	5,961	77,493	0.897	0.314	1.211	
	-	-	-	-	-	4,875	-	-	-	-	

Note: Conveyance losses of 35% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, and irrigal diversion etc.

Calculating process; ((1) x (4) = (2) x (5) + (3) x (6)) x 10 = (7)

(7)/86.400 = (8), (8) + (9) = (10)

Data 4.2.12 Irrigation Requirement & Diversion Requirement / Second Cropping Paddy (1500 ha) / Sragen Region

ALT-1

Month	Puddling Requirement for nursely (mm)	Puddling Requirement for transplanting (mm)	Unit Irrigation Requirement (mm/day)	Hecterage to Supplied Water: Nursery Puddling (ha)	Hecterage to Supplied Water: Transplanting Puddling (ha)	Hecterage to Supplied Water: On Crawing Stage (ha)	Irrigation Requirement (m3/day)	Irrigation Requirement (m3/day)	Conveyance Losses (m3/sec.)	Diversion Requirement (m3/sec.)	Remarks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
	-	-	-	-	-	-	-	-	-	-	
Apr.	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	
May	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	
Jun.	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	
Jul.	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	
Aug.	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	
Sep.	150	-	8.7	1.2	-	5	522	0.005	0.002	0.007	
	150	-	9.6	1.2	-	18	1,824	0.021	0.007	0.028	
	150	200	9.1	1.2	12	48	4,459	0.052	0.018	0.070	
Oct.	150	200	9.5	1.2	26	255	24,320	0.281	0.098	0.379	
	150	200	8.3	1.2	26	506	42,081	0.487	0.170	0.657	
	100	150	-	1.2	26	755	40,500	0.469	0.164	0.633	
Nov.	-	150	0.7	-	26	1.001	46,007	0.532	0.186	0.718	
	-	150	4.1	-	26	1.238	89,758	1.039	0.364	1.403	
	-	150	2.1	-	12	1.458	48,618	0.563	0.197	0.760	
Dec.	-	-	-	-	-	1.500	-	-	-	-	
	-	-	3.5	-	-	1.500	52,500	0.608	0.213	0.821	
	-	-	-	-	-	1.500	-	-	-	-	
Jan.	-	-	-	-	-	1.500	-	-	-	-	
	-	-	0.9	-	-	1.376	12,389	0.143	0.050	0.193	
	-	-	-	-	-	1.125	-	-	-	-	
Feb.	-	-	-	-	-	875	-	-	-	-	
	-	-	1.1	-	-	626	6,886	0.080	0.028	0.108	
	-	-	1.3	-	-	375	4,875	0.056	0.020	0.076	
Mar.	-	-	-	-	-	125	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	

Note : Conveyance losses of 35% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, and irrigal diversion etc.

Calculating process; ((1) x (4) + (2) x (5) + (3) x (6)) x 10 = (7)
(7)/86.400 = (8), (8) + (9) = (10)

Data 4.2.13 Irrigation Requirement & Diversion Requirement / Sugar Cane (1500 ha x 2) / Sragen Region

ALT- 1

Month	Puddling Requirement for norsely (mm)	Puddling Requirement for trans-planting (mm)	Unit Irrigation Requirement (mm/day)	Hecterage to Supplied Water: Norsery Puddling (ha)	Hecterage to Supplied Water: Sugar Cane	Hecterage to Supplied Water: On Crawing Stage (ha)	Irrigation Requirement (m3/day)	Irrigation Requirement (m3/day)	Conveyance Losses (m3/sec.)	Diversion Requirement (m3/sec.)	Remarks
			(1)		(2)		(3)	(4)	(5)	(6)	
Apr.			2.3		2,084		47,932	0.555	0.194	0.749	
			-		2,250		-	-	-	-	
			-		2,417		-	-	-	-	
May			-		2,499		-	-	-	-	
			1.2		2,500		30,000	0.347	0.122	0.469	
			3.3		2,499		81,967	0.954	0.335	1.289	
Jun.			1.0		2,417		24,170	0.20	0.178	0.378	
			3.9		2,250		87,750	1.016	0.355	1.371	
			4.0		2,084		83,360	0.965	0.337	1.302	
Jul.			4.3		1,917		82,431	0.954	0.334	1.288	
			4.4		1,751		77,044	0.892	0.312	1.204	
			4.9		1,584		77,616	0.898	0.315	1.213	
Aug.			6.9		1,500		-	-	-	-	
			6.1		1,500		91,500	1,059	0.376	1.430	
			6.3		1,500		94,500	1.094	0.383	1.477	
Sep.			7.0		1,500		105,000	1.215	0.426	1.641	
			6.5		1,500		97,500	1.128	0.395	1.523	
			7.2		1,500		108,000	1.250	0.438	1.688	
Oct.			6.1		1,500		91,500	1.059	0.371	1.430	
			6.2		1,500		93,000	1.076	0.377	1.453	
			4.1		1,500		61,500	0.712	0.249	0.961	
Nov.			-		1,500		-	-	-	-	
			-		1,500		-	-	-	-	
			0		1,500		-	-	-	-	
Dec.			-		1,500		-	-	-	-	
			-		1,500		-	-	-	-	
			-		1,500		-	-	-	-	
Jan.			-		1,500		-	-	-	-	
			-		1,500		-	-	-	-	
			-		1,500		-	-	-	-	
Feb.			-		1,500		-	-	-	-	
			-		1,500		-	-	-	-	
			-		1,500		-	-	-	-	
Mar.			-		1,584		-	-	-	-	
			-		1,751		-	-	-	-	
			-		1,917		-	-	-	-	

Note : Conveyance losses of 35% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, and irrigal diversion etc.

Calculating process; (1) x (2) x 10 = (3) (3)/86.400 = (4) (4) + (5) = (6)

Data 4.2.14 Irrigation Requirement & Diversion Requirement / Paddy (3600 ha) / Dengkeng Region

ALT-1

Month	Puddling Requirement for norsely (mm)	Puddling Requirement for trans-planting (mm)	Unit Irrigation Requirement (mm/day)	Hecterage to Supplied Water: Nursery Puddling (ha)	Hecterage to Supplied Water: Transplanting Puddling (ha)	Hecterage to Supplied Water: On Crawing Stage (ha)	Irrigation Requirement (m3/day)	Irrigation Requirement (m3/day)	Conveyance Losses (m3/sec.)	Diversion Requirement (m3/sec.)	Remarks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
	-	-	4.2	-	-	2,099	88,158	1.020	0.306	1.326	
	-	-	-	-	-	1,501	-	-	-	-	
Apr.	-	-	-	3.0	-	911	3,000	0.035	0.010	0.045	
	100	-	-								
	150	-	-	3.0	-	342	4,500	0.052	0.016	0.068	
	150	200	4.5	3.0	29	115	67,675	0.783	0.235	1.018	
May	150	200	7.2	3.0	61	612	170,564	1.974	0.592	2.566	
	150	200	8.3	3.0	61	1,213	227,179	2.629	0.789	3.418	
	150	200	8.5	3.0	61	1,811	280,435	3.246	0.974	4.220	
Jun.	-	200	8.6	-	61	2,401	328,486	3.802	1.140	4.942	
	-	200	9.6	-	61	2,970	407,120	4.712	1.414	6.126	
	-	200	6.6	-	29	3,499	288,934	3.344	1.003	4.347	
Jul	-	-	9.9	-	-	3,600	366,400	4.125	1,238	5.363	
	-	-	10.7	-	-	3,600	385,200	4.458	1.338	5.796	
	-	-	10.3	-	-	3,600	370,800	4.292	1.287	5.579	
Aug.	-	-	9.4	-	-	3,600	338,400	3.917	1.175	5.092	
	-	-	10.0	-	-	3,301	330,100	3.821	1.146	4.967	
	-	-	9.5	-	-	2,700	256,500	2.969	0.890	3.859	
Sep.	-	-	8.9	-	-	2,099	186,811	2.162	0.649	2.811	
	-	-	7.1	-	-	1,501	106,571	1.233	0.370	1.603	
	-	-	6.3	-	-	900	56,700	0.656	0.197	0.853	
Oct.	-	-	-	-	-	299	-	-	-	-	
	100	-	2.9	3.0	-	11	3,319	0.038	0.012	0.050	
	100	-	1.9	3.0	-	43	3,817	0.044	0.013	0.057	
Nov.	100	150	2.7	3.0	29	115	49,605	1.094	0.328	1.422	
	100	150	-	3.0	61	621	94,500	1,094	0.328	1.422	
	100	150	-	3.0	61	1,213	94,500	1.094	0.328	1.422	
Dec.	100	150	2.5	3.0	61	1.811	234,275	2.712	0.813	3.525	
	-	150	-	-	61	2,401	91,500	1.059	0.318	1.377	
	-	150	-	-	61	2,970	91,500	1.059	0.318	1.377	
Jan.	-	150	1.0	-	29	3,499	126,490	1.464	0.439	1.903	
	-	-	-	-	-	3,600	-	-	-	-	
	-	-	0.2	-	-	3,600	7,200	0.083	0.025	0.108	
Feb.	-	-	-	-	-	3,600	-	-	-	-	
	-	-	1.1	-	-	3,600	39,600	0.458	0.138	0.596	
	-	-	0.4	-	-	3,301	13,204	0.153	0.046	0.199	
Mar.	-	-	-	-	-	2,700	-	-	-	-	

Note : Conveyance losses of 30% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, and irrigal diversion etc.

Calculating process; ((1) x (4) + (2) x (5) + (3) x (6)) x 10 = (7)
(7)/86.400 = (8), (8) + (9) = (10)

Data 4.2.15 Diversion Requirement and Water Balance

(1961 / 1962)

Unit : $m^3/sec.$

ALT-1

Month	Ten Day Period.	Karanganyar Area				Sragen Area				Right Bank	Left Bank	Total	Outflow	Inflow	Monthly Balance	Balance	Storage Capacity ($\times 10^6 m^3$)
		Paddy	Seconday Paddy	Sugar Cane	Sub Total	Paddy	Second Paddy	Sugar Cane	Sub Total								
A	1	2.628	–	0.072	2.700	3.079	–	0.749	3.828	6.528	1.326	7.854	2.9				
	2	–	–	–	–	0.254	–	–	0.254	0.254	–	0.254					
	3	0.107	–	–	0.107	0.341	–	–	0.341	0.448	0.045	0.493					
M	1	0.234	–	–	0.234	0.126	–	–	0.126	0.360	0.068	0.428	6.7	16.9	10.2	10.2	
	2	2.143	–	0.188	2.601	1.924	–	–	1.924	4.525	1.018	5.543					
	3	6.106	–	0.477	6.583	4.838	–	–	4.838	11.421	2.566	13.987					
J	1	8.131	–	0.495	8.626	5.649	–	0.378	6.027	14.653	3.418	18.07	23.1	0.10	23.0	-12.8	33.2
	2	9.647	–	0.470	10.117	7.938	–	1.371	9.309	19.426	4.220	23.646					
	3	11.755	–	0.377	12.132	9.295	–	1.302	10.597	22.729	4.942	27.671					
J	1	14.568	–	0.445	15.013	11.513	–	1.288	12.801	27.814	6.126	33.940	31.1	-1.10	-32.2	-45.0	206.5
	2	12.693	–	0.202	12.895	11.201	–	1.204	12.405	25.300	4.347	29.647					
	3	12.749	–	0.425	13.174	10.055	–	1.213	11.268	24.442	5.363	29.805					
A	1	13.777	–	0.512	14.289	10.867	–	1.383	12.250	26.539	5.796	32.335	30.8	-1.30	-32.1	-77.1	206.5
	2	13.262	–	0.530	13.792	10.461	–	1.430	11.891	25.683	5.579	31.262					
	3	12.104	–	0.547	12.651	9.547	–	1.417	10.964	23.615	5.092	28.707					
S	1	11.807	–	0.608	12.415	9.314	–	1.641	10.955	23.370	4.967	28.337	22.5	-1.40	-23.9	-101.0	261.8
	2	9.174	0.014	0.530	9.718	6.855	0.007	1.523	8.385	18.103	3.859	21.962					
	3	6.681	0.021	0.625	7.327	5.270	0.028	1.688	6.986	14.313	2.811	17.124					
O	1	3.705	0.179	0.512	4.396	3.008	0.070	1.430	4.508	8.904	1.603	10.507	6.8	-1.40	-8.2	-109.2	292.5
	2	2.028	0.434	0.547	3.009	1.600	0.379	1.453	3.432	6.441	0.853	7.294					
	3	0.096	0.446	0.035	0.577	0.321	0.657	0.961	1.939	2.516	–	2.516					
N	1	0.109	0.303	–	0.412	0.084	0.633	–	0.717	1.129	0.050	1.179	2.9	2.30	-0.6	-109.8	284.6
	2	0.132	0.373	–	0.505	0.084	0.718	–	0.802	1.307	0.057	1.364					
	3	1.817	0.597	0.122	2.536	1.397	1.403	–	2.800	5.336	0.746	6.082					
D	1	3.800	0.336	–	4.136	2.910	0.760	–	3.670	7.806	1.422	9.228	9.6	9.90	0.3	-109.5	293.3
	2	3.384	–	–	3.384	2.686	–	–	2.686	6.070	1.422	7.492					
	3	3.384	–	–	3.384	4.270	0.821	–	5.091	8.475	3.525	12.000					
J	1	3.277	–	–	3.277	2.602	–	–	2.602	5.879	1.377	7.256	7.0	58.1	51.1	-58.4	156.4
	2	3.277	–	–	3.277	2.602	–	–	2.602	5.879	1.377	7.256					
	3	1.541	–	–	1.541	2.996	0.193	–	3.189	4.730	1.903	6.633					
F	1	–	–	–	–	1.219	–	–	1.219	1.219	–	1.219	1.5	40.1	38.6	-19.8	47.9
	2	–	–	–	–	–	–	–	–	–	0.108	0.108					
	3	0.644	–	–	0.644	2.539	0.108	–	2.647	3.291	–	3.291					
M	1	3.090	0.015	–	3.105	3.047	0.076	–	3.123	6.228	0.596	6.824	4.1	41.3	37.2	-17.4	46.6
	2	–	–	–	–	1.211	–	–	1.211	1.211	0.199	1.410					
	3	–	–	–	–	–	–	–	–	–	–	–					

Data-4.3.1 Unit Irrigation Requirement / Paddy / Karanganyar Region

ALT-2 unit : mm/day

Month	Ten Day Period	(1) Evaporation	(2) Crop Coefficient	(3) Evapotranspiration (1) x (2)	(4) Percolation	(5) Water Requirement (3)+(4)	(6) Farm Waste (5)x 0.10 or 0.05	(7) Effective rainfall (61-62)	(8) Unit Irrigation Requirement (5)+(6)-(7)
	1		-	-		-	-	2.0	-
A	2	4.6	-	-	1.0	-	-	9.0	-
	3		0.91	4.19		5.19	0.52	6.6	-
	1		0.96	4.90		6.40	0.32	5.2	1.5
M	2	5.1	1.00	5.10	1.5	6.60	0.33	1.5	5.4
	3		1.05	5.36		6.86	0.34	-	7.2
	1		1.08	6.37		7.87	0.39	-	8.3
J	2	5.9	1.12	6.61	1.5	8.11	0.41	0.6	7.9
	3		1.14	6.73		8.23	0.42	-	8.7
	1		1.20	7.68		9.8	0.46	-	10.3
J	2	6.4	1.23	7.87	1.5	9.37	0.47	1.3	8.5
	3		1.24	7.94		9.44	0.47	-	9.9
	1		1.21	8.71		10.21	0.51	-	10.7
A	2	7.2	1.15	8.28	1.5	9.78	0.49	-	10.3
	3		1.04	7.49		8.99	0.45	-	9.4
	1		0.99	7.92		9.42	0.47	-	9.9
S	2	8.0	0.93	7.44	1.5	8.44	0.45	-	9.4
	3		0.90	7.20		8.70	0.44	-	9.1
	1		0.89	6.05		7.55	0.38	0.2	7.7
O	2	6.8	0.91	6.19	1.5	7.69	0.38	-	8.1
	3		0.98	6.66		8.16	0.41	4.3	4.3
	1		1.09	6.00		7.00	0.70	6.1	1.6
N	2	5.5	1.14	6.27	1.0	7.27	0.73	5.3	2.7
	3		1.20	6.60		7.60	0.76	3.1	5.3
	1		1.23	5.29		6.24	0.63	4.2	2.7
D	2	4.3	1.24	5.33	1.0	6.33	0.63	10.3	-
	3		1.21	5.20		6.20	0.62	6.8	-
	1		1.15	4.26		5.26	0.53	12.1	-
J	2	8.7	1.04	3.85	1.0	4.85	0.49	9.5	-
	3		1.00	3.70		4.70	0.47	9.1	-
	1		0.94	3.38		4.38	0.44	8.9	-
F	2	3.6	0.87	3.13	1.0	4.13	0.41	9.9	-
	3		0.77	2.77		3.77	0.38	6.1	-
	1		0.66	2.57		3.57	0.36	3.2	0.7
M	2	3.9	0.50	1.95	1.0	2.95	0.30	5.6	-
	3		-	-		-	-	13.1	-

Note: Farm Waste (Dry season ... 5%, Rainy season ... 10%)

Data-4.3.2 Unit Irrigation Requirement / Polowijo / Karanganyar Region

ALT-2 unit : mm/day

Month	Ten Day Period	(1) Evaporation	(2) Crop Coefficient	(3) Evapotranspiration (1) x (2)	(4) Percolation	(5) Water Requirement (3)+(4)	(6) Farm Waste (5)x 0.10 or 0.05	(7) Effective rainfall (61-62)	(8) Unit Irrigation Requirement (5)+(6)-(7)
	1		0.66	3.04		3.04	0.46	2.8	0.7
A	2	4.6	0.66	3.04		3.04	0.46	7.0	-
	3		0.67	3.08		3.08	0.46	7.0	-
	1		0.66	3.37		3.37	0.34	6.7	-
M	2	5.1	0.63	3.21		3.21	0.32	2.0	1.5
	3		0.60	3.06		3.06	0.31	-	3.4
	1		0.54	3.19		3.69	0.32	-	3.5
J	2	5.9	0.47	2.77		2.77	0.28	-	3.1
	3		-	-		-	-	0.6	-
	1							-	-
J	2	6.4	-	-		-	-	2.4	-
	3							-	-
	1							-	-
A	2	7.2	-	-		-	-	-	-
	3							-	-
	1							-	-
S	2	8.0	-	-		-	-	-	-
	3							-	-
	1							0.3	-
O	2	6.8	-	-		-	-	-	-
	3							6.0	-
	1							7.0	-
N	2	5.5	-	-		-	-	7.0	-
	3							4.0	-
	1							7.0	-
D	2	4.3	-	-		-	-	7.0	-
	3							7.0	-
	1		-	-		-	-	7.0	-
J	2	3.7	-	-		-	-	7.0	-
	3		0.35	1.30		1.30	0.20	7.0	-
	1		0.41	1.48		1.48	0.22	7.0	-
F	2	3.6	0.47	1.69		1.69	0.25	7.0	-
	3		0.53	1.91		1.91	0.29	7.0	-
	1		0.58	2.26		2.26	0.34	4.3	-
M	2	3.9	0.61	2.38		2.36	0.35	7.0	-
	3		0.62	2.42		2.42	0.36	7.0	-

Note : Farm waste (Dry season ... 5%, Rainy season ... 10%)

Data-4.3.3 Unit Irrigation Requirement / Paddy / Sragen Region

ALT-2 unit : mm/day

Month	Ten Day Period	(1) Evaporation	(2) Crop Coefficient	(3) Evapotranspiration (1) x (2)	(4) Percolation	(5) Water Requirement (3)+(4)	(6) Farm Waste (5)x 0.10 or 0.05	(7) Effective rainfall (61-62)	(8) Unit Irrigation Requirement (5)+(6)-(7)
	1		-	-		-	-	0.8	-
A	2	4.6	-	-	1.0	-	-	4.4	-
	3		0.91	4.19		5.19	0.52	3.8	1.9
	1		0.96	4.90		6.40	0.32	7.1	-
M	2	5.1	1.00	5.10	1.5	6.60	0.33	1.6	5.3
	3		1.05	5.36		6.86	0.34	-	7.2
	1		1.08	6.37		7.87	0.39	2.3	5.9
J	2	5.9	1.12	6.61	1.5	8.11	0.41	-	8.5
	3		1.14	6.73		8.23	0.42	-	8.7
	1		1.20	7.68		9.18	0.46	-	9.6
J	2	6.4	1.23	7.87	1.5	9.37	0.47	-	9.8
	3		1.24	7.94		9.44	0.47	-	9.9
	1		1.21	8.71		10.21	0.51	-	10.7
A	2	7.2	1.15	8.28	1.5	9.78	0.49	-	10.3
	3		1.04	7.49		8.99	0.45	-	9.4
	1		0.99	7.92		9.42	0.47	-	10.0
S	2	8.0	0.93	7.44	1.5	8.94	0.45	0.5	9.0
	3		0.90	7.20		8.70	0.44	-	9.1
	1		0.89	6.05		7.55	0.38	-	7.9
O	2	6.8	0.91	6.19	1.5	7.69	0.38	-	8.1
	3		0.98	6.66		8.16	0.41	1.4	7.2
	1		1.09	6.00		7.27	0.73	8.4	-
N	2	5.5	1.14	6.27	1.0	7.27	0.73	7.3	0.7
	3		1.20	6.60		7.60	0.76	4.3	4.1
	1		1.23	5.29		6.29	0.63	4.8	2.1
D	2	4.3	1.24	5.33	1.0	6.33	0.63	8.3	-
	3		1.21	5.20		6.20	0.62	3.3	3.5
	1		1.15	4.26		5.26	0.53	1.4	4.4
J	2	3.7	1.04	3.85	1.0	4.85	0.49	9.2	-
	3		1.00	3.70		4.70	0.47	4.3	0.9
	1		0.94	3.38		4.38	0.44	4.8	-
F	2	3.6	0.87	3.13	1.0	4.13	7.7	-	
	3		0.77	2.77		3.77	0.38	3.1	1.1
	1		0.66	2.57		3.57	0.36	2.6	1.3
M	2	3.9	0.50	1.95	1.0	2.95	0.30	4.1	-
	3		-	-		-	-	11.5	-

Note : Farm waste (Dry season ... 5%, Rainy season ... 10%)

Data-4.3.4 Unit Irrigation Requirement / Polowijo / Sragen Region

ALT-2 unit : mm/day

Month	Ten Day Period	(1) Evaporation	(2) Crop Coefficient	(3) Evapotranspiration (1) x (2)	(4) Percolation	(5) Water Requirement (3)+(4)	(6) Farm Waste (5)x 0.10 or 0.05	(7) Effective rainfall (61-62)	(8) Unit Irrigation Requirement (5)+(6)-(7)
	1		0.66	3.04		3.04	0.46	1.1	2.4
A	2	4.6	0.66	3.04	1.0	3.04	0.46	7.0	-
	3		0.67	3.08		3.08	0.46	5.2	-
	1		0.66	3.37		3.37	0.34	9.6	-
M	2	5.1	0.63	3.21	1.5	3.21	0.32	2.1	1.4
	3		0.63	3.06		3.06	0.31	-	3.4
	1		0.54	3.19		3.19	0.32	2.8	0.7
J	2	5.9	0.47	2.77	1.5	2.77	0.28	-	3.1
	3		-	-		-	-	-	-
	1							0.1	-
J	2	6.4	-	-	1.5	-	-	0.2	-
	3							-	-
	1							-	-
A	2	7.2	-	-	1.5	-	-	-	-
	3							-	-
	1							-	-
S	2	8.0	-	-	1.5	-	-	0.6	-
	3							-	-
	1							0.1	-
O	2	6.8	-	-	1.5	-	-	0.1	-
	3							2.3	-
	1							7.0	-
N	2	5.5	-	-	1.0	-	-	7.0	-
	3							5.4	-
	1							7.0	-
D	2	4.3	-	-	1.0	-	-	7.0	-
	3							4.3	-
	1		-	-		-	-	7.0	-
J	2	3.7	-	-	1.0	-	-	7.0	-
	3		0.35	1.30		1.30	0.20	6.0	-
	1		0.41	1.48		1.48	0.22	7.0	-
F	2	3.6	0.47	1.69	1.0	1.69	0.25	7.0	-
	3		0.53	1.91		1.91	0.29	4.4	-
	1		0.58	2.26		2.26	0.34	3.7	-
M	2	3.9	0.61	2.38	1.0	2.36	0.35	5.3	-
	3		0.62	2.42		2.42	0.32	7.0	-

Note : Farm waste (Dry season ... 5%, Rainy season ... 10%)

Data-4.3.5 Unit Irrigation Requirement / Paddy / Dengkeng Region

ALT-2 unit : mm/day

Month	Ten Day Period	(1) Evaporation	(2) Crop Coefficient	(3) Evapotranspiration (1) x (2)	(4) Percolation	(5) Water Requirement (3)+(4)	(6) Farm Waste (5)x 0.10 or 0.05	(7) Effective rainfall (61-62)	(8) Unit Irrigation Requirement (5)+(6)-(7)
	1		-	-		-	-	1.4	-
A	2	4.6	-	-	1.0	-	-	12.5	-
	3		0.91	4.19		5.19	0.52	7.2	-
	1		0.96	4.90		6.40	0.32	7.6	-
M	2	5.1	1.00	5.10	1.5	6.60	0.33	1.8	5
	3		1.05	5.36		6.86	0.34	-	7.2
	1		1.08	6.37		7.87	0.39	-	8.3
J	2	5.9	1.12	6.61	1.5	8.11	0.41	-	8.5
	3		1.14	6.73		8.23	0.42	-	8.7
	1		1.20	7.68		9.28	0.46	-	9.6
J	2	6.4	1.23	7.87	1.5	9.37	0.47	3.2	6.6
	3		1.24	7.94		9.44	0.47	-	9.9
	1		1.21	8.71		10.21	0.51	-	10.7
A	2	7.2	1.15	8.28	1.5	9.78	0.49	-	10.3
	3		1.04	7.49		8.99	0.45	-	9.4
	1		0.99	7.92		9.42	0.47	-	9.9
S	2	8.0	0.93	7.44	1.5	8.94	0.45	-	9.4
	3		0.90	7.20		0.70	0.44	-	9.1
	1		0.89	6.05		7.55	0.38	-	7.9
O	2	6.8	0.91	6.19	1.5	7.69	0.38	-	8.1
	3		0.98	6.66		8.16	0.41	5.3	3.3
	1		1.09	6.00		7.27	0.70	3.7	4.3
N	2	5.5	1.14	6.27	1.0	7.27	0.73	5.0	3
	3		1.20	6.60		7.60	0.76	4.5	3.9
	1		1.23	5.29		6.29	0.63	7.4	-
D	2	4.3	1.24	5.33	1.0	6.33	0.63	9.4	-
	3		1.21	5.20		6.20	0.62	3.9	2.9
	1		1.15	4.26		5.26	0.53	16.4	-
J	2	3.7	1.04	3.85	1.0	4.85	0.49	7.5	-
	3		1.00	3.70		4.70	0.47	5.1	0.1
	1		0.94	3.38		4.38	0.44	8.9	-
F	2	3.6	0.87	3.13	1.0	4.13	0.41	5.7	-
	3		0.77	2.77		3.77	0.38	6.5	-
	1		0.66	2.57		3.57	0.36	4.5	-
M	2	3.9	0.50	1.95	1.0	2.95	0.30	5	-
	3		-	-		-	-	12.2	-

Note : Farm waste (Dry season ... 5%, Rainy season ... 10%)

Data-4.3.6 Unit Irrigation Requirement / Polowijo / Dengkeng Region

ALT-2 unit : mm/day

Month	Ten Day Period	(1) Evaporation	(2) Crop Coefficient	(3) Evapotranspiration (1) x (2)	(4) Percolation	(5) Waster Requirement (3)+(4)	(6) Farm Waste (5) x 0.10 or 0.05	(7) Effective Rainfall (61-62)	(8) Unit Irrigation Requirement (5)+(6)-(7)
	1		0.66	3.04		3.04	0.46	2.1	1.4
A	2	4.6	0.66	3.04	1.0	3.04	0.46	7.0	-
	3		0.67	3.08		3.08	0.46	7.0	-
	1		0.66	3.37		3.37	0.34	7.0	-
M	2	5.1	0.63	3.21	1.5	3.21	0.32	2.2	1.3
	3		0.60	3.04		3.06	0.31	-	3.4
	1		0.54	3.19		3.19	0.32	-	3.5
J	2	5.9	0.47	2.77	1.5	2.77	0.28	-	3.1
	3		-	-		-	-	-	-
	1							-	-
J	2	6.4	-	-	1.5	-	-	4	-
	3							-	-
	1							-	-
A	2	7.2	-	-	1.5	-	-	-	-
	3							-	-
	1							-	-
S	2	8.0	-	-	1.5	-	-	-	-
	3							-	-
	1							0.3	-
O	2	6.8	-	-	1.5	-	-	-	-
	3							6.6	-
	1							4.6	-
N	2	5.5	-	-	1.0	-	-	6.7	-
	3							5.6	-
	1							7.0	-
D	2	4.3	-	-	1.0	-	-	7.0	-
	3							5.4	-
	1		-	-		-	-	7.0	-
J	2	3.7	-	-	1.0	-	-	7.0	-
	3		0.35	1.30		1.30	0.20	6.8	-
	1		0.41	1.48		1.48	0.22	7.0	-
F	2	3.6	0.47	1.69	1.0	1.69	0.25	7.0	-
	3		0.53	1.91		1.91	0.29	7.0	-
	1		0.58	2.26		2.26	0.34	5.6	-
M	2	3.9	0.61	2.38	1.0	2.36	0.35	7.0	-
	3		0.62	2.42		2.42	0.36	7.0	-

Note : Farm waste (Dry season ... 5%, Rainy season ... 10%)

Data-4.3.7 Irrigation Requirement & Diversion Requirement / Paddy (8900 ha) / Karanganyar Region

ALT-7

Month	Puddling Requirement for nursery (mm)	Puddling Requirement for transplanting (mm)	Unit Irrigation Requirement mm/day	Hecterage to Supplied Water: Nursery Puddling ha	Hecterage to Supplied Water: Transplanting Puddling ha	Hecterage to Supplied Water: On Grawing Stage ha	Irrigation Requirement m^3/day	Irrigation Requirement m^3/day	Conveyance Losses m^3/sec.	Diversion Requirement m^3/sec.	Remarks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
	-	-	-	-	-	-	-	-	-	-	
Apr.	-	-	-	-	-	-	-	-	-	-	
	100	-	-	7.4	-	27	7,400	0.086	0.021	0.107	
	150	-	1.5	7.4	-	107	12,705	0.147	0.037	0.184	
May	150	200	5.4	7.4	7	285	168,790	1.950	0.488	2.438	
	150	200	7.2	7.4	151	1513	422,036	4.885	1.221	6.106	
	150	200	8.3	7.4	151	2999	562,017	6.505	1.626	8.131	
June	150	200	7.9	-	151	4477	655,683	7.589	1.897	9.486	
	-	200	8.7	-	151	4936	818.432	9.476	2.365	11.841	
	-	200	10.3	-	151	7343	1.058.329	12.249	3.062	15.311	
Jul	-	200	8.5	-	71	8657	877,335	10.154	2.539	12.693	
	-	-	9.9	-	-	8900	881.100	10.20	2.550	12.750	
	-	-	10.7	-	-	8900	952,300	11.022	2.755	13.777	
Aug	-	-	10.3	-	-	8900	916,700	10.610	2.653	13.263	
	-	-	9.4	-	-	8900	836.000	9.683	2.421	12.104	
	150	-	9.9	3.7	-	8170	814,380	9.426	2.356	11.782	
Sep	150	-	9.4	7.4	-	6746	645.224	7.468	1.867	9.335	
	150	-	9.1	7.4	-	5331	496,221	5.743	1.436	7.179	
	150	200	7.7	7.4	-	4486	356.522	4.126	1.032	5.158	
Oct	150	200	8.1	7.4	-	4477	373,737	4.326	1.082	5.407	
	150	200	4.3	7.4	-	4477	203,611	2.357	0.589	2.946	
	100	150	1.6	3.7	151	5215	313,640	3.630	0.908	4.538	
Nov	-	150	2.7	-	151	6639	405,753	4.696	1.174	5.870	
	-	150	5.3	-	151	8046	652,938	7.557	1.889	9.446	
	-	-	2.7	-	151	8900	240,300	2.781	0.695	3.476	
Dec	-	-	-	-	151	8900	-	-	-	-	
	-	-	-	-	151	8900	-	-	-	-	
	-	-	-	-	-	8900	-	-	-	-	
Jan	-	-	-	-	-	8713	-	-	-	-	
	-	-	-	-	-	7413	-	-	-	-	
	-	-	-	-	-	5936	-	-	-	-	
Feb	-	-	-	-	-	4450	-	-	-	-	
	-	-	-	-	-	2964	-	-	-	-	
	-	-	0.7	-	-	14876	104,132	1.205	0.301	1.506	
Mar	-	-	-	-	-	187	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	

Note: Conveyanee losses of 25% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, and irrigal diversion etc.

Culculating process

((1) X (4) + (2) X (5) + (3) X (6)) X 10 = (7)

(7) /86.400 = (8): (8) + (9) = (10)

Data-4.3.8 Irrigation Requirement & Diversion Requirement /Polowijo (8,900 ha)/Karanganyar Region

ALT-2

Month	Puddling Requirement for nursery (mm) 1)	Puddling Requirement for transplanting (mm) 2)	Unit Irrigation Requirement (mm/day) 3)	Hecterage to be supplied water: Nursery Puddling (ha) 4)	Hecterage to be supplied water: Transplanting puddling (ha) 5)	Hecterage to be supplied water: On grawing stage (ha) 6)	Irrigation Requirement (m3/day) 7)	Irrigation Requirement (m^3/sec) 8)	Conveyance losses (m^3/sec) 9)	Diversion Requirement (m^3/sec) 10)	Remarks
Apr.			0.7			8,900	62,300	0.721	0.180	0.901	
			-			8,900	-	-	-	-	
			-			8,161	-	-	-	-	
May.			-			6,675	-	-	-	-	
			1.5			5,189	77,835	0.901	0.225	1.126	
			3.7			3,711	126,177	1.760	0.365	1.825	
June.			3.5			2,225	77,875	0.901	0.225	1.126	
			3.1			739	22,909	0.265	0.066	0.331	
			-			-	-	-	-	-	
Jul.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Aug.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Sep.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Oct.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Nov.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Dec.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Jan.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			739	-	-	-	-	
Feb.			-			2,225	-	-	-	-	
			-			3,711	-	-	-	-	
			-			5,189	-	-	-	-	
Mar.			-			6,675	-	-	-	-	
			-			8,161	-	-	-	-	
			-			8,900	-	-	-	-	

Note : Conveyance losses of 25% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, and irrigal diversion etc.

Culculating process

(1) x (2) x 10 = (3) (3)/86,400 = (4) (4) + (5) = (6)

Data 4.3.9 Irrigation Requirement & Diversion Requirement / Paddy (6,500 ha) / Sragen Region

ALT – 2

Month	Puddling Requirement: for nursery (mm) 1)	Puddling Requirement: for transplanting (mm) 2)	Unit Irrigation Requirement (mm/day) 3)	Hecterage to be supplied water: Nursery Puddling (ha) 4)	Hecterage to be supplied water: Transplanting puddling (ha) 5)	Hecterage to be supplied water: On grawing stage (ha) 6)	Irrigation Requirement (m^3/day) 7)	Irrigation Requirement (m^3/sec) 8)	Conveyance losses (m^3/sec) 9)	Diversion Requirement (m^3/sec) 10)	Remarks
Apr.	–	–	–	–	–	–	–	–	–	–	
	–	–	–	–	–	–	–	–	–	–	
	100	–	1.9	5.4	–	20	5,780	0.067	0.023	0.090	
May	150	–	–	5.4	–	78	8,100	0.094	0.033	0.127	
	150	200	5.3	5.4	52	208	123,124	1.425	0.499	1.924	
	150	200	7.2	5.4	111	1,105	309,660	3.584	1.254	4.838	
June	150	200	5.9	5.4	111	2,191	351,269	4.066	1.423	5.489	
	150	200	8.5	5.4	111	3,270	508,050	5.880	2.058	7.938	
	–	200	8.7	–	111	4,336	599,232	6.936	2.427	9.363	
Jul.	–	200	9.6	–	111	5,336	734,256	8.498	2.974	11.472	
	–	200	9.8	–	52	6,318	723,164	8,370	2.930	11.300	
	–	–	9.9	–	–	6,500	643,500	7.448	2.607	10.055	
Aug.	–	–	10.7	–	–	6,500	695,500	8.050	2.818	10.868	
	–	–	10.3	–	–	6,500	669,500	7.749	2.712	10.461	
	–	–	9.4	–	–	6,500	611,000	7.072	2.475	9.547	
Sep.	150	–	10.0	2.7	–	5,967	600,750	6.953	2.434	9.387	
	150	–	9.0	5.4	–	4,927	451,530	5.225	1.829	7.054	
	150	–	9.1	5.4	–	3,894	402,954	4.664	1.632	6.296	
Oct.	150	200	7.9	5.4	111	3,276	488,904	5.659	1.981	7.640	
	150	200	8.1	5.4	111	3,270	765,570	8.861	3.101	11.962	
	150	200	7.2	5.4	111	3,270	465,540	5.388	1.886	7.274	
Nov.	100	150	–	2.7	111	3,809	169,200	1.958	0.685	2.644	
	–	150	0.7	–	111	4,849	200,443	2.320	0.812	3.132	
	–	150	4.1	–	111	5,876	407,416	4.715	1.650	6.365	
Dec.	–	–	2.1	–	–	6,500	136,500	1.580	0.553	2.133	
	–	–	–	–	–	6,500	–	–	–	–	
	–	–	3.5	–	–	6,500	237,500	2.633	0.922	3.555	
Jan.	–	–	4.4	–	–	6,500	286,000	3.310	1.159	4.469	
	–	–	–	–	–	6,364	–	–	–	–	
	–	–	0.9	–	–	5,415	48,735	0.564	0.197	0.761	
Feb.	–	–	–	–	–	4,336	–	–	–	–	
	–	–	–	–	–	3,250	–	–	–	–	
	–	–	1.1	–	–	2,165	23,815	0.276	0.097	0.373	
Mar.	–	–	1.3	–	–	1,086	14,118	0.163	0.057	0.220	
	–	–	–	–	–	137	–	–	–	–	
	–	–	–	–	–	–	–	–	–	–	

Note: Conveyance losses of 35% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, and irrigal diversion etc.

Culculating process :

((1) x (4) + (2) x (5) + (3) x (6)) x 10 = (7)

(7)/86,400 = (8), (8) + (9) = (10)

Date 4.3.10 Irrigation Requirement & Diversion Requirement /Polowijo (6,500 ha)/Sragen Region

ALT-2

Month	Puddling Requirement		Unit Irrigation Requirement	Hecterage to be supplied water			Irrigation Requirement		Conveyance losses	Diversion Requirement	Remarks
	for nursery (mm) 1)	for transplanting (mm) 2)	(mm/day) 3)	Nursery Puddling (ha) 4)	Transplanting puddling (ha) 5)	On grawing stage (ha) 6)	(m^3/day) 7)	(m^3/sec) 8)	(m^3/sec) 9)	(m^3/sec 10)	
			2.4			6,500	156,000	1.806	0.632	2.438	
Apr.			-			6,500	-	-	-	-	
			-			5,961	-	-	-	-	
			-			4,875	-	-	-	-	
May			-			3,790	53,060	0.614	0.215	0.829	
			3.4			2,711	92,174	1.067	0.373	1.440	
			0.7			1,625	11,375	0.132	0.046	0.178	
June			3.1			540	16,740	0.194	0.068	0.262	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
July			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Aug.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Sep.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Oct.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Nov.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Dec.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Jan.			-			-	-	-	-	-	
			-			540	-	-	-	-	
			-			1,625	-	-	-	-	
Peb.			-			2,711	-	-	-	-	
			-			3,790	-	-	-	-	
			-			4,875	-	-	-	-	
Mar.			-			5,961	-	-	-	-	
			-			6,500	-	-	-	-	

Note: Conveyance losses of 35% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, and irrigal diversion etc.

Culculating process

(1) x (2) x 10 = (3) (3)/86,400 = (4) (4) + (5) = (6)

Data-4.3.11 Irrigation Requirement & Diversion Requirement /Paddy (3600 ha)/Dengkeng Region

ALT-2

Month	Puddling Requirement for nursery (mm) 1)	Puddling Requirement for transplanting (mm) 2)	Unit Irrigation Requirement (mm/day) 3)	Hecterage to be supplied water: Nursery Puddling (ha) 4)	Hecterage to be supplied water: Transplanting puddling (ha) 5)	Hecterage to be supplied water: On grawing stage (ha) 6)	Irrigation Requirement (m^3/day) 7)	Irrigation Requirement (m^3/sec) 8)	Conveyance losses (m^3/sec) 9)	Diversion Requirement (m^3/sec) 10)	Remarks
	-	-	-	-	-	-	-	-	-	-	
Apr.	-	-	-	-	-	-	-	-	-	-	
	100	-	-	4.6	3.0	11	4,600	0.053	0.016	0.069	
	150	-	-	6.7	3.0	43	10,050	0.116	0.035	0.151	
May	150	200	5	5.6	3.0	115	20,150	0.233	0.070	0.303	
	150	200	7.2	7.2	3.0	612	60,864	0.704	0.211	0.915	
	150	200	8.3	8.3	3.0	1,213	119,129	1.379	0.414	1.793	
June	150	200	8.5	8.5	3.0	1,811	172,685	1.999	0.600	2.599	
	-	200	8.7	8.7	-	2,401	208,887	2.418	0.725	3.143	
	-	200	9.6	9.6	-	2,970	285,120	3.300	0.990	4.290	
Jul.	-	200	6.6	9.8	-	3,499	230,934	2.673	0.802	3.475	
	-	-	9.9	9.9	-	3,600	356,400	4.125	1.238	5.363	
	-	-	10.7	10.7	-	3,600	385,200	4.458	1.337	5.795	
Aug.	-	-	10.3	10.3	-	3,600	370,800	4.292	1.288	5.580	
	-	-	9.4	9.4	-	3,600	338,400	3.916	1.175	5.091	
	150	-	9.9	9.9	1.5	3,305	342,045	3.959	1.188	5.147	
Sep.	150	-	9.4	9.4	3.0	2,729	270,626	3.132	0.940	4.072	
	150	-	9.1	9.1	3.0	2,156	209,846	2.429	0.729	3.158	
	150	200	7.9	6.3	3.0	1,814	158,756	1.837	0.551	2.388	
Oct.	150	200	8.1	8.1	3.0	1,811	164,841	1.908	0.572	2.480	
	150	200	3.3	7.1	3.0	1,811	76,413	0.884	0.265	1.149	
	100	150	4.3	-	1.5	2,110	92,980	1.076	0.323	1.399	
Nov.	-	150	3	6.1	-	2,686	80,580	0.933	0.280	1.213	
	-	150	3.9	2.8	-	3,254	126,906	1.469	0.441	1.910	
	-	-	-	-	-	3,600	-	-	-	-	
Dec.	-	-	-	1.2	-	3,600	-	-	-	-	
	-	-	2.9	-	-	3,600	104,400	1.208	0.362	1.570	
	-	-	-	-	-	3,600	-	-	-	-	
Jan.	-	-	-	2.8	-	3,524	-	-	-	-	
	-	-	0.1	-	-	2,999	2,999	0.035	0.011	0.046	
	-	-	-	-	-	2,401	-	-	-	-	
Feb.	-	-	-	3.0	-	1,800	-	-	-	-	
	-	-	-	-	-	1,199	-	-	-	-	
	-	-	-	-	-	601	-	-	-	-	
Mar.	-	-	-	-	-	76	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	

Note: Conveyance lossesof 30% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, and irrigal diversion etc.

Culculating process:

((1) X (4) + (2) X (5) + (3) X (6)) X 10 = (7)

(7)/86,400 = (8), (8) + (9) = (10)

Data 4.3.12 Irrigation Requirement & Diversion Requirement /Polowijo (3,600 ha)/Dengkeng Region

ALT-2

Month	Puddling Requirement for nursery (mm) 1)	Puddling Requirement for transplanting (mm) 2)	Unit Irrigation Requirement (mm/day) 3)	Hecterage to be supplied water: Nursery Puddling (ha) 4)	Hecterage to be supplied water: Transplanting puddling (ha) 5)	Hecterage to be supplied water: On grawing stage (ha) 6)	Irrigation Requirement (m^3/day) 7)	Irrigation Requirement (m^3/sec) 8)	Conveyance losses (m^3/sec) 9)	Diversion Requirement (m^3/sec) 10)	Remarks
			1.4			3,600	50,400	0.583	0.175	0.758	
Apr.			-			3,600	-	-	-	-	
			-			3,301	-	-	-	-	
			-			2,700	-	-	-	-	
May			1.3			2,099	27.287	0.316	0.095	0.411	
			3.4			1,501	51,034	0.591	0.177	0.768	
			3.5			900	31,500	0.365	0.110	0.475	
June			3.1			299	9,269	0.107	0.032	0.139	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Jul.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Aug.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Sep.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Oct.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Nov.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Dec.			-			-	-	-	-	-	
			-			-	-	-	-	-	
			-			-	-	-	-	-	
Jan.			-			-	-	-	-	-	
			-			299	-	-	-	-	
			-			900	-	-	-	-	
Feb.			-			1,501	-	-	-	-	
			-			2,099	-	-	-	-	
			-			2,700	-	-	-	-	
Mar.			-			3,301	-	-	-	-	
			-			3,600	-	-	-	-	

Note: Conveyance losses of 30% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, end irrigal diversion etc.
Culculating process:

(1) x (2) x 10 = (3) (3)/86,400 = (4) + (5) = (6)

Data 4.3.13 Diversion Requirement and Water Balance

(1961 / 1962)

ALT-2

Unit: $m^3/sec.$

Month	Ten-Day Period	Karanganyar Area					Sragen Area					Right Bank	Dengkeng A		Left Bank	Total	Out Flow	In Flow	Monthly Balance	Balance	Storage Capacity ($x10^6 m^3$)
		Paddy	Polo-wijo	Sugar Cane	Second Paddy	Sub Total (1)	Paddy	Polo-wijo	Sugar Cane	Second Paddy	Sub Total (2)	(1+2)	Paddy (4)	Polo-wijo (5)	(4+5)						
A	1		0.901	0.070		0.971	-	2.437	0.300	-	2.737	3.708	-	0.758	0.758	4.466	2.4				
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	3	0.107	-	-	-		0.090	-	-	-	0.090	0.197	0.069	-	0.069	0.266					
M	1	0.184	-	-	-	0.184	0.127	-	-	-	0.127	0.311	0.151	-	0.151	0.462					
	2	2.438	1.126	0.182	-	3.745	1.924	0.829	0.188	-	2.941	6.687	0.303	0.411	0.714	7.401	8.2	16.9	8.7	8.7	
	3	6.106	1.825	0.471	-	8.402	4.838	1.440	0.516	-	6.794	15.196	0.916	0.768	1.684	16.880					
J	1	8.131	1.127	0.499	-	9.757	5.484	0.178	0.140	-	5.807	15.564	1.792	0.474	2.266	17.830					
	2	9.486	0.331	0.469	-	10.286	7.938	0.262	0.508	-	8.708	18.994	2.598	0.139	2.737	21.731	21.6	0.10	21.5	12.8	33.2
	3	11.841	-	0.373	-	12.214	9.363	-	0.479	-	9.842	22.056	3.143	-	3.143	25.199					
J	1	15.311	-	0.449	-	15.760	11.473	-	0.470	-	11.943	27.703	4.290	-	4.290	31.993					
	2	12.693	-	0.205	-	12.898	11.299	-	0.436	-	11.735	24.633	3.475	-	3.475	28.108	29.7	-1.10	-30.8	-43.6	116.8
	3	12.750	-	0.428	-	13.178	10.035	-	0.459	-	10.494	23.672	5.363	-	5.363	29.035					
A	1	13.777	-	0.522	-	14.299	10.867	-	0.554	-	11.421	25.720	5.796	-	5.796	31.516					
	2	8.488	-	0.527	-	9.015	10.461	-	0.572	-	11.033	20.048	5.579	-	5.579	25.627	28.3	-1.30	-29.6	-73.2	196.1
	3	12.104	-	0.543	-	12.647	9.547	-	0.591	-	10.138	22.785	5.092	-	5.092	27.877					
S	1	11.782	-	0.611	-	12.393	9.387	-	0.656	-	10.043	22.436	5.147	-	5.147	27.583					
	2	9.335	-	0.619	0.015	9.969	9.055	-	0.609	0.014	7.678	17.647	4.072	-	4.072	21.719	22.4	-1.40	-23.8	-97.0	251.4
	3	7.179	-	0.627	0.022	7.828	6.295	-	0.675	0.022	6.993	14.821	3.157	-	3.157	17.978					
O	1	5.158	-	0.512	0.193	5.863	7.639	-	0.572	0.195	8.406	14.269	2.389	-	2.389	16.658					
	2	5.407	-	0.545	0.469	6.421	11.962	-	0.582	0.475	13.019	19.440	2.480	-	2.480	21.920	17.1	-1.40	-18.5	-115.5	309.4
	3	2.946	-	0.031	0.482	3.459	7.274	-	0.385	0.586	8.245	11.704	1.150	-	1.150	12.854					
N	1	4.538	-	-	0.327	4.865	2.644	-	-	0.242	2.886	7.751	1.399	-	1.399	9.150					
	2	5.870	-	-	0.403	6.273	3.132	-	-	0.278	3.410	9.683	1.212	-	1.212	10.895	13.0	2.3	- 10.7	-126.2	327.1
	3	9.446	-	0.125	0.644	10.215	6.366	-	-	0.551	6.917	17.132	1.909	-	1.909	19.041					
D	1	3.477	-	-	0.363	3.840	2.133	-	-	0.308	2.441	6.281	-	-	-	6.281					
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.9	9.9	4.0	-122.2	327.3
	3	-	-	-	-	-	3.555	-	-	0.328	3.883	3.883	1.571	-	1.571	5.454					
J	1	-	-	-	-	-	4.469	-	-	-	4.469	4.469	-	-	-	4.469					
	2	-	-	-	-	-	-	-	-	-	0	-	-	-		-	2.7	58.1	55.4	-66.8	178.9
	3	-	-	-	-	-	0.761	-	-	0.077	0.838	0.838	0.045	-	0.045	0.883					
F	1	-	-	-	-	-		-	-	-	-	-	-	-	-	-					
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.4	40.1	39.7	-27.1	65.6
	3	-	-	-	-	-		-	-	0.043	0.415	0.415	-	-	-	0.415					
M	1	1.507	-	-	0.016	1.523	0.221	-	-	0.030	0.251	1.774	-	-	-	1.774					
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.8	41.3	39.5	-	-
	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					

Data-4.4.1 Unit Irrigation Requirement / Paddy / Karanganyar Region

ALT-3 unit : mm/day

Month	Ten Day Period	(1) Evaporation	(2) Crop Coefficient	(3) Evapotranspiration (1) x (2)	(4) Percolation	(5) Water Require- (3)+(4)	(6) Farm Waste (5)x 0.10 or 0.05	(7) Effective rainfall (61-62)	(8) Unit Irrigation Requirement (5)+(6)-(7)
	1		1.08	4.97		5.97	0.60	2.0	4.6
A	2	4.6	1.08	4.97	1.0	5.97	0.60	9.0	-
	3		1.08	4.97		5.97	0.60	6.6	-
	1		1.08	5.51		7.01	0.35	5.2	2.2
M	2	5.1	1.08	5.51	1.5	7.01	0.35	1.5	5.9
	3		1.08	5.51		7.01	0.35	-	7.4
	1		1.08	6.37		7.87	0.39	-	8.3
J	2	5.9	1.08	6.37	1.5	7.87	0.39	0.6	7.7
	3		1.08	6.37		7.87	0.39	-	8.3
	1		1.08	6.91		8.41	0.42	-	8.8
J	2	6.4	1.07	6.85	1.5	8.35	0.42	1.3	7.5
	3		1.06	6.78		8.28	0.41	-	8.7
	1		1.06	7.63		9.13	0.46	-	9.6
A	2	7.2	1.05	7.56	1.5	9.06	0.45	-	9.5
	3		1.05	7.56		9.06	0.45	-	9.5
	1		1.05	8.40		9.90	0.50	-	10.4
S	2	8.0	1.05	8.40	1.5	9.90	0.50	-	10.4
	3		1.05	8.40		9.90	0.50	-	10.4
	1		1.06	7.21		8.71	0.44	0.2	9
O	2	6.8	1.27	7.28	1.5	8.78	0.44	-	9.2
	3		1.08	7.34		8.84	0.44	4.3	5
	1		1.11	6.11		7.11	0.71	6.1	1.7
N	2	5.5	1.06	5.83	1.0	6.83	0.68	5.3	2.2
	3		1.08	5.94		6.94	0.69	3.1	4.5
	1		1.08	4.64		5.64	0.56	4.2	2
D	2	4.3	1.08	4.64	1.0	5.64	0.56	10.3	-
	3		1.08	4.64		5.64	0.56	6.8	-
	1		1.08	4.00		5.00	0.50	12.1	-
J	2	3.7	1.08	4.00	1.0	5.00	0.50	9.5	-
	3		1.08	4.00		5.00	0.50	9.1	-
	1		1.08	3.89		4.89	0.49	8.7	-
F	2	3.6	1.08	3.89	1.0	4.89	0.49	9.7	-
	3		1.08	3.89		4.89	0.49	6.1	-
	1		1.08	4.21		5.21	0.52	3.2	2.5
M	2	3.9	1.08	4.21	1.0	5.21	0.52	5.6	0.1
	3		1.08	4.21		5.21	0.52	13.1	-

Note : Farm waste (Dry season ... 5%, Rainy season ... 10%)

Data-4.4.2 Unit Irrigation Requirement / Paddy / Sragen Region

ALT-3 unit : mm/day

Month	Ten Day Period	(1) Evaporation	(2) Crop Coefficient	(3) Evapotranspiration (1) x (2)	(4) Percolation	(5) Water Requirement (3)+(4)	(6) Farm Waste (5)x 0.10 or 0.05	(7) Effective Rainfall (61-62)	(8) Unit Irrigation Requirement (5)+(6)-(7)
	1		1.08	4.97		5.97	0.60	0.8	5.8
A	2	4.6	1.08	4.97	1.0	"	0.60	4.4	2.2
	3		1.08	4.97		"	0.60	3.8	2.8
	1		1.08	5.51		7.01	0.35	7.1	0.3
M	2	1.08	5.51	1.5	"	0.35	1.6	5.8	
	3		1.08	5.51		"	0.35	-	7.4
	1		1.08	6.37		7.87	0.39	2.3	6.0
J	2	5.9	1.08	6.37	1.5	"	0.39	-	8.3
	3		1.08	6.37		"	0.39	-	8.3
	1		1.08	6.91		8.41	0.42	-	8.8
J	2	6.4	1.07	6.85	1.5	8.35	0.42	-	8.8
	3		1.06	6.78		8.28	0.41	-	8.7
	1		1.06	7.63		9.13	0.46	-	9.6
A	2	7.2	1.05	7.54	1.5	9.06	0.45	-	9.5
	3		1.05	7.56		9.06	0.45	-	9.5
	1		1.05	8.40		9.90	0.50	-	10.4
S	2	8.0	1.05	8.40	1.5	9.90	0.50	0.5	9.9
	3		1.05	8.40		9.90	0.50	-	10.4
	1		1.06	7.21		8.71	0.44	-	9.2
O	2	6.8	1.07	7.28	1.5	8.78	0.44	-	9.2
	3		1.08	7.34		8.84	0.44	1.4	7.9
	1		1.11	6.11		7.11	0.71	8.4	-
N	2	5.5	1.06	5.83	1.0	6.83	0.68	7.3	0.2
	3		1.08	5.94		6.94	0.69	4.3	3.3
	1		1.08	4.64		5.64	0.56	4.8	1.4
D	2	4.3	1.08	4.64	1.0	5.64	"	8.3	-
	3		1.08	4.64		5.64	"	3.3	2.9
	1		1.08	4.00		5.00	0.50	14.0	-
J	2	3.7	1.08	4.00	1.0	5.00	"	9.2	-
	3		1.08	4.00		5.00	"	4.3	1.2
	1		1.08	3.99		4.89	0.49	4.8	0.6
F	2	3.6	1.08	3.89	1.0	4.89	"	7.7	-
	3		1.08	3.89		4.89	"	3.1	2.3
	1		1.08	4.21		5.21	0.52	2.6	3.1
M	2	3.9	1.08	4.21	1.0	5.21	"	4.1	1.6
	3		1.08	4.21		5.21	"	11.5	-

Note : Farm waste (Dry season ... 5%, Rainy season ... 10%)

Data 4.4.3 Unit Irrigation Requirement / Paddy / Dengkeng Region

ALT-3 unit : mm/day

Month	Ten Day Period	Evaporation	Crop Coefficient	Evapotranspiration (1) x (2)	Percolation	Water Requirement (3)+(4)	Farm Waste (5)x 0.10 or 0.05	Effective rainfall (61-62)	Unit Irrigation Requirement (5)+(6)-(7)
	1		1.08	4.97		5.97	0.60	1.90	5.2
A	2	4.6	1.08	4.97	1.0	"	"	12.5	-
	3		1.08	4.97		"	"	7.2	-
	1		1.08	5.51		7.01	0.35	7.6	-
M	2	5.1	1.08	5.51	1.5	"	"	1.8	5.6
	3		1.08	5.51		"	"	-	7.4
	1		1.08	6.37		7.87	0.39	-	8.3
J	2	5.9	1.08	6.37	1.5	"	"	-	"
	3		1.08	6.37		"	"	-	"
	1		1.08	6.91		8.41	0.42	-	8.8
J	2	6.4	1.07	6.85	1.5	8.35	0.42	3.2	5.6
	3		1.06	6.78		8.28	0.41	-	8.7
	1		1.06	7.63		9.13	0.46	-	9.6
A	2	7.2	1.05	7.56	1.5	9.06	0.45	-	9.5
	3		1.05	7.56		"	"	-	9.5
	1		1.05	8.40		9.90	0.50	-	10.4
S	2	8.0	1.05	8.40	1.5	"	"	-	10.4
	3		1.05	8.40		"	"	-	10.4
	1		1.06	7.21		8.71	0.44	-	9.2
O	2	6.8	1.07	7.28	1.5	8.78	"	-	9.2
	3		1.08	7.34		8.84	"	5.3	3.9
	1		1.11	6.11		7.11	0.71	3.7	4.1
N	2	5.5	1.06	5.83	1.0	6.83	0.68	5.0	2.5
	3		1.08	5.94		6.94	0.69	4.5	3.1
	1		1.08	4.64		5.64	0.56	7.4	-
D	2	4.3	1.08	4.64	1.0	"	"	9.4	-
	3		1.08	4.64		"	"	3.9	1.2
	1		1.08	4.00		5.00	0.50	16.4	-
J	2	3.7	1.08	4.00	1.0	"	"	7.5	-
	3		1.08	4.00		"	"	5.1	-
	1		1.08	3.89		4.89	0.49	8.9	-
F	2	3.6	1.08	3.89	1.0	"	"	5.7	-
	3		1.08	3.89		"	"	6.5	-
	1		1.08	4.21		5.21	0.52	4.5	6.2
M	2	3.9	1.08	4.21	1.0	"	"	5	0.7
	3		1.08	4.21		"	"	12.2	-

Note: Farm waste (Dry season.... 5%, Rainy season... 10%)

Data-4.4.4 Irrigation Requirement & Diversion Requirement / Paddy (4450 ha x 2) / Karanganyar Region

ALT-3

Month	Puddling Requirement for nursery (mm)	Puddling Requirement for transplanting (mm)	Unit Irrigation Requirement (mm/day)	Hecterage to Supplied Water: Nursery Puddling (ha)	Hecterage to Supplied Water: Transplanting Puddling (ha)	Hecterage to Supplied Water: On Grawing Stage (ha)	Irrigation Requirement (m3/day)	Irrigation Requirement (m3/day)	Conveyance Losses (m3/sec.)	Diversion Requirement (m3/sec.)	Remarks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
	100	150	4.6	3.7	76	6.688	425,348	4.923	1.231	6.157	
Apr.	100	150	–	–	76	7.049	114,000	1.319	0.330	1.649	
	100	150	–	3.7	76	7.023	117,700	1.362	0.341	1.703	
	150	200	2.2	3.7	36	6.973	230,956	2.673	0.668	3.341	
May	150	200	5.9	3.7	36	6.448	457,982	5.301	1.325	6.626	
	150	200	7.4	3.7	76	6.319	625,156	7.236	1.809	9.045	
	150	200	8.3	3.7	76	6.319	682,027	7.894	1.974	9.867	
June	150	200	7.7	3.7	76	6.688	672,526	7.784	1.946	9.770	
	–	200	8.3	–	76	7.049	737,067	8.531	2.133	10.664	
	150	200	8.8	1.9	76	7.013	771,994	8.935	2.234	11.169	
Jul.	150	200	7.5	3.2	36	6.955	599,175	6.935	1.734	8.669	
	150	–	8.7	3.7	–	6.373	560,349	6.486	1.622	8.107	
	150	200	9.6	3.7	76	5.950	728,750	8.435	2.109	10.543	
Aug.	150	200	9.5	3.7	76	5.945	722,325	8.360	2.090	10.450	
	150	200	9.5	3.7	76	6.319	757,855	8.771	2.193	10.964	
	150	–	10.4	1.9	76	6.688	698,402	8.083	2.021	10.104	
Sep.	150	200	10.4	1.9	76	6.662	842,698	9.811	2.453	12.264	
	150	200	10.4	3.7	76	6.653	849,462	9.832	2.458	12.290	
	150	–	9	3.7	–	6.377	579,420	6.702	1.676	8.384	
Oct.	150	200	9.2	3.7	76	5.950	547,400	6.336	1.584	7.920	
	150	200	5	3.7	76	5.945	187,775	2.168	0.542	2.709	
	100	150	1.7	3.7	76	6.319	225,123	2.606	0.652	3.257	
Nov.	100	150	2.2	1.9	76	6.954	269,108	3.115	0.779	3.893	
	–	150	4.5	–	76	7.027	430,215	4.980	1.245	6.224	
	100	150	2	3.7	76	7.064	258,980	2.997	0.749	3.747	
Dec.	100	–	–	3.7	–	6.728	3,700	0.643	0.011	0.054	
	100	150	–	3.7	36	6.074	57,700	0.668	0.167	0.835	
	100	150	–	3.7	76	5.950	117,700	1.362	0.341	1.703	
Jan.	100	150	–	3.7	76	6.043	117,700	1.362	0.341	1.703	
	100	150	–	3.7	76	6.595	117,700	1.362	0.341	1.703	
	–	150	–	–	76	6.675	114,000	1.319	0.330	1.649	
Feb.	100	150	–	3.7	76	6.653	117,700	1.362	0.341	1.703	
	100	150	–	3.7	36	6.604	57,700	0.668	0.167	0.235	
	100	150	2.5	3.7	36	6.074	57,700	0.668	0.167	0.835	
Mar.	100	150	0.1	3.7	76	5.950	123,650	1.431	0.378	1.789	
	100	150	–	3.7	76	6.043	117,700	1.362	0.341	1.703	

Note: Conveyance losses of 25% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, and irrigal diversion etc.

Calculating process ; ((1) x (4) + (2) x (5) + (3) x (6)) x 10 = (7)

(7)/86.400 = (8), (8) + (9) = (10)

Data-4.4.5 Irrigation Requirement & Diversion Requirement / Paddy (3250 ha x 2) / Sragen Region

ALT-3

Month	Puddling Requirement for nursery (mm)	Puddling Requirement for transplanting (mm)	Unit Irrigation Requirement (mm/day)	Hecterage to Supplied Water: Nursery Puddling (ha)	Hecterage to Supplied Water: Transplanting Puddling (ha)	Hecterage to Supplied Water: On Growing Stage (ha)	Irrigation Requirement (m3/day)	Irrigation Requirement (m3/day)	Conveyance Losses (m3/sec.)	Diversion Requirement (m3/sec.)	Remarks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
	100	150	5.8	2.7	55	4.885	368,530	4.265	1.493	5.758	
Apr.	-	150	2.2	-	55	5.148	195,756	2.266	0.793	3.059	
	100	150	2.8	2.7	55	5.129	228,672	2.647	0.926	3.573	
	150	200	0.3	2.7	26	5.093	713,290	8.255	2.889	11.145	
May	150	200	5.8	2.7	26	4.709	329,172	3.810	1.334	5.144	
	150	200	7.4	2.7	55	4.615	455,560	5.273	1.846	7.118	
	150	200	6.0	2.7	55	4.615	390,950	4.525	1.525	1.584	
June	150	200	8.3	2.7	55	4.885	519,505	6.013	2.105	8.117	
	-	200	8.3	-	55	5.148	537,284	6.219	2.177	8.395	
	150	200	8.8	1.4	55	5.122	562,836	6.514	2.280	8.794	
Jul.	150	200	8.8	2.7	26	5.080	503,090	5.823	2.038	7.861	
	150	-	8.7	2.7	-	4.651	409,209	4.736	1.658	6.394	
	150	200	9.6	2.7	55	4.345	531,170	6.148	2.152	8.300	
Aug.	150	200	4.5	2.7	55	4.342	526,540	6.094	2.133	8.227	
	150	200	9.5	2.7	55	4.615	552,475	6.394	2.238	8.632	
	150	200	10.4	1.4	55	4.885	620,140	7.178	2.512	9.690	
Sep.	150	200	9.9	1.4	55	4.865	593,735	6.872	2.405	9.277	
	150	200	10.4	2.7	55	4.859	619,386	7.169	2.509	9.678	
	150	-	9.2	2.7	-	4.657	432,494	5.006	1.752	6.758	
Oct.	150	200	9.2	2.7	55	4.345	513,790	5.947	2.081	8.028	
	150	200	7.9	2.7	55	4.342	457,068	5.290	1.852	7.142	
	100	150	-	2.7	55	4.615	85,200	0.986	0.345	1.331	
Nov.	100	150	0.2	1.4	55	5.086	940,720	10.888	3.811	14.699	
	-	150	3.3	-	55	5.132	251,856	2.915	1.020	3.935	
	100	150	1.4	2.7	55	5.116	156,824	1.815	0.635	2.450	
Dec.	100	-	-	2.7	-	4.914	2,700	0.031	0.011	0.042	
	100	150	2.9	2.7	26	4.436	173,044	2.003	0.701	2.704	
	100	150	-	2.7	55	4.345	85,200	0.986	0.345	1.331	
Jan.	100	150	-	2.7	55	4.414	85,200	0.986	0.345	1.331	
	100	150	1.2	2.7	55	4.817	133,404	1.544	0.540	2.084	
	-	150	0.6	-	55	4.875	111,750	1.293	0.453	1.746	
Feb.	100	150	-	2.7	55	4.859	85,200	0.986	0.345	1.331	
	100	150	2.3	2.7	26	4.823	152,629	1.767	0.618	2.385	
	100	150	3.1	2.7	26	4.436	179,216	2.074	0.726	2.800	
Mar.	100	150	1.6	2.7	55	4.345	154,720	1.790	0.627	2.417	
	100	150	-	2.7	55	4.414	85,200	0.986	0.345	1.331	

Note: Conveyance losses of 35% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, and irrigal diversion etc.

Calculating process ; ((1) x (4) + (2) x (5) + (3) x (6)) x 10 = (7)

(7) /86, 100 = (8), (8) + (9) = (10)

Data 4.4.6 Irrigation Requirement & Diversion Requirement / Paddy (1800 ha x 2) / Dengkeng Region

ALT-3

Month	Puddling Requirement for nursely (mm)	Puddling Requirement for transplanting (mm)	Unit Irrigation Requirement (mm/day)	Hecterage to Supplied Water: Nursery Puddling (ha)	Hecterage to Supplied Water: Transplanting Puddling (ha)	Hecterage to Supplied Water: On Grawing Stage (ha)	Irrigation Requirement (m3/day)	Irrigation Requirement (m3/day)	Conveyance Losses (m3/sec.)	Diversion Requirement (m3/sec.)	Remarks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
	100	150	5.2	1.5	31	2.705	188,660	2.184	0.655	2.839	
Apr.	100	150	-	-	31	2.851	46,500	0.538	0.161	0.699	
	100	150	-	1.5	31	2.840	48,000	0.556	0.167	0.723	
	150	200	-	1.5	14	2.821	30,250	0.350	0.105	0.455	
May	150	200	5.6	1.5	14	2.608	176,298	2.040	0.612	2.652	
	150	200	7.4	1.5	31	2.556	253,394	2.933	0.880	3.813	
	150	200	8.3	1.5	31	2.556	276,398	3.199	0.960	4.159	
June	150	200	8.3	1.5	31	2.705	288,765	3.342	1.003	4.345	
	150	200	8.3	-	31	2.851	298,633	3.456	1.037	4.493	
	150	200	8.8	0.8	31	2.837	312,856	3.621	1.086	4.707	
Jul.	150	200	5.6	1.5	14	2.813	187,778	2.173	0.652	2.825	
	150	200	8.7	1.5	-	2.579	226,623	2.623	0.787	3.410	
	150	200	9.6	1.5	31	2.407	295,322	3.418	1.025	4.443	
Aug.	150	200	9.5	1.5	31	2.405	292,725	3.388	1.016	4.404	
	150	200	9.5	1.5	31	2.556	307,079	3.554	1.066	4.620	
	150	200	10.4	0.8	31	2.705	344,520	3.988	1.196	5.184	
Sep.	150	200	10.4	0.8	31	2.695	343,480	3.975	1.193	5.168	
	150	200	10.4	1.5	31	2.691	344,114	3.983	1.195	5.178	
	150	200	9.2	1.5	-	2.579	239,518	2.772	0.832	3.604	
Oct.	150	200	9.2	1.5	31	2.407	285,694	3.307	0.992	4.299	
	650	200	3.9	1.5	31	2.405	158,045	1.829	0.549	2.378	
	100	150	4.1	1.5	31	2.556	152,796	1.768	0.530	2.298	
Nov.	100	150	1.9	0.8	31	2.817	100,823	1.167	0.350	1.517	
	100	150	3.1	-	31	2.842	134,602	1.558	0.467	2.025	
	100	150	-	1.5	31	2.833	48,000	0.556	0.167	0.722	
Dec.	100	150	-	1.5	-	2.722	1,500	0.017	0.005	0.022	
	100	150	1.2	1.5	14	2.457	51,984	0.602	0.181	0.783	
	100	150	-	1.5	31	2. 07	48,000	0.556	0.167	0.723	
Jan.	100	150	-	1.5	31	2.444	48,000	0.556	0.167	0.723	
	100	150	-	1.5	31	2.668	48,000	0.556	0.167	0.723	
	100	150	-	-	31	2.700	46,500	0.538	0.161	0.699	
Peb.	100	150	-	1.5	31	2.691	48,000	0.556	0.167	0.723	
	100	150	-	1.5	14	2.671	22,500	0.260	0.078	0.338	
	100	150	6.2	1.5	14	2.457	174,834	2.024	0.607	2.631	
Mar.	100	150	0.7	1.5	31	2.407	64,849	0.751	0.225	0.975	
	100	150	-	1.5	31	2.444	48,000	0.556	0.167	0.723	

Note: Conveyance losses of 30% of irrigation requirement are estimated from main canal to farm ditches leakage through holes and gates, and irrigal diversion etc.

Calculating process; ((1) x (4) + (2) x (5) + (3) x (6)) x 10 = (7)

(7)/86,400 = (8), (8) + (9) = (10)

Date 4.4.7 Diversion Requirement and Water Balance

(1961 / 1962)

ALT-3

Unit: $m^3/sec.$

		Karanganyar Area														Storage Capacity x $10^6 m^3$
		Paddy	Second* Paddy	Sugar* Cane	Sub Total	Paddy	Second Paddy *	Sugar Cane*	Sub Total	Right Bank	Left Bank	Total	Outflow	Inflow	Monthly Balance	Balance	
	1	6.154	-	0.072	6.226	5.758	-	0.749	6.507	12.733	2.839	15.572					
A	2	1.649	-	-	1.649	3.060	-	-	3.060	4.709	0.700	5.409	9.0				
	3	1.703	-	-	1.703	3.573	-	-	3.573	5.276	0.722	5.998					
	1	3.341	-	-	3.341	11.145	-	-	11.145	14.486	0.455	14.941					
H	2	6.626	-	-	0.188	6.814	-	-	5.144	11.928	2.653	14.581	16.7	16.9	0.2	0.2	
	3	9.045	-	0.477	9.522	7.118	-	-	7.118	16.640	3.813	20.453					
	1	9.867	-	0.495	10.362	6.109	-	0.378	6.487	16.849	4.159	21.008					
J	2	9.720	-	0.470	10.190	8.117	-	1.371	9.488	19.678	4.345	24.023	23.4	0.10	23.3	23.3	59.9
	3	10.664	-	0.377	11.041	8.395	-	1.302	9.697	20.738	4.493	25.231					
	1	11.169	-	0.495	11.614	8.784	-	1.288	10.072	21.686	4.707	26.393					
J	2	8.669	-	0.202	8.871	7.861	-	1.204	9.065	17.936	2.825	20.761	22.2	-1.10	-23.3	-46.4	124.3
	3	8.107	-	0.425	8.532	6.400	-	1.213	7.613	16.145	3.410	19.555					
	1	10.543	-	0.512	11.055	8.300	-	1.383	9.683	0.738	4.444	25.182					
A	2	10.450	-	0.530	10.980	8.227	-	1.430	9.657	20.637	4.04	25.041	25.5!	-1.30	-26.8	-73.2	196.1
	3	10.964	-	0.547	11.511	8.632	-	1.417	10.049	21.560	4.620	26.180					
	1	10.104	-	0.608	10.712	9.689	-	1.641	11.330	22.042	5.184	27.226					
S	2	12.264	0.014	0.530	12.808	9.277	0.007	1.523	10.807	23.615	5.168	28.783	28.5	-1.40	-9.9	-103.1	267.2
	3	12.290	0.021	0.625	12.936	9.678	0.028	1.688	11.394	24.330	5.179	29.509					
	1	8.384	0.179	0.512	9.075	6.758	0.070	1.430	8.258	17.333	3.604	20.973					
O	2	7.920	0.434	0.547	8.901	8.028	0.379	1.453	9.860	18.761	4.299	23.060	19.5	-1.40	-20.9	-124.0	332.1
	3	2.709	0.446	0.035	3.190	7.142	0.657	0.961	8.760	11.950	2.378	14.328					
	1	3.257	0.303	-	3.560	1.331	0.633	-	1.964	5.524	2.299	7.823					
N	2	3.893	0.373	-	4.266	14.698	0.718	-	15.416	19.682	1.517	21.199	14.4	2.30	-12.1	-136.1	352.8
	3	6.224	0.597	0.122	6.943	3.925	1.403	-	5.308	12.271	2.025	14.296					
	1	3.747	0.336	-	4.083	2.450	0.760	-	3.210	7.293	0.722	8.015					
D	2	0.054	-	-	0.054	0.042	-	-	0.042	0.096	0.023	0.119	4.4	9.90	5.5	-130.6	349.8
	3	0.835	-	-	0.835	2.704	0.821	-	3.525	4.360	0.782	5.142					
	1	1.703	-	-	1.703	1.331	-	-	1.331	3.034	0.722	3.756					
J	2	1.703	-	-	1.703	1.331	-	-	1.331	3.034	0.722	3.756	4.1	58.1	54.0	-76.6	205.2
	3	1.703	-	-	1.703	2.084	0.193	-	2.277	3.980	0.722	4.702					
	1	1.649	-	-	1.649	1.746	-	-	1.746	3.395	0.700	4.095					
F	2	1.703	-	-	1.703	1.331	-	-	1.331	3.034	0.722	3.756	3.8	40.1	36.3	-40.3	97.5
	3	0.835	-	-	0.835	2.385	0.108	-	2.493	3.328	0.339	3.667					
	1	0.835	0.015	-	0.850	2.700	0.076	-	2.876	3.726	2.631	6.357					
M	2	1.789	-	-	1.789	2.417	-	-	2.417	4.206	0.975	5.181	5.1	41.3	36.2	-4.1	11.0
	3	1.703	-	-	1.703	1.331	-	-	1.331	3.034	0.722	3.756					

Data-5. OTHERS

Data 5.1 Record of Inflow and Outflow in Madiun Basin

Date of Measurement	Stream No.	Stream	Discharge (m^3/s) Inflow	Outflow
27-8-1975	149	C	0.383	
	150	C	0.013	
	151	C	0.050	
	152	C	0.009	
	153	C	0.002	
	154	C	0.001	
	155	C	0.002	
	156	C	0.001	
	157	R	0.046	
	158	C	0.001	
	159	C	0.019	
	160	R	0.001	
	161	C	0.001	
	162	R	1.626	
	163	R	0.002	
	164	R	0.001	
	165	C	0.001	
	166	C	0.001	
	167	R	0.001	
	168	C	0.001	
	169	R	0.177	
	170	C	0.078	
28-8-1975	171	R	0.189	
	172	R	0.056	
	173	C	0.002	
	174	C	0.067	
	175	R	0.212	
	176	C	0.030	
	177	C	0.038	
	178	C	0.001	
	179	C	0.002	
	180	R	0.043	
	181	C	0.001	
	182	C	0.002	

Data 5.1 (continued)

Date of Measurement	Stream No.	Stream	Discharge (m^3/s) Inflow	Outflow
28-8-1975	183	C	0.002	
	184	C	0.002	
	185	R	0.003	
	186	C	0.002	
	187	C	0.002	
	188	C	0.056	
	189	R	0.041	
	190	C	0.001	
	191	C	0.002	
	192	R	0.046	
	193	C	0.042	
	194	R	0.008	
	195	C	0.011	
	196	R	0.041	
	197	C	0.010	
	198	R	0.041	
	199	C	0.030	
	200	R	1.153	
	201	R	0.002	
	202	C	0.001	
	203	C	0.028	
	204	R	0.098	
	205	C	0.002	
	206	R	0.173	
	207	C	0.002	
	208	C	0.028	
	209	C	0.002	
	210	R	0.018	
	211	C	0.001	
	212	R	0.002	
	213	R	0.114	
	214	R	0.001	
	215	R	0.030	
	216	R	0.211	
	217	C	0.021	
	218	C	0.012	
	219	C	0.001	

Data 5.1 (continued)

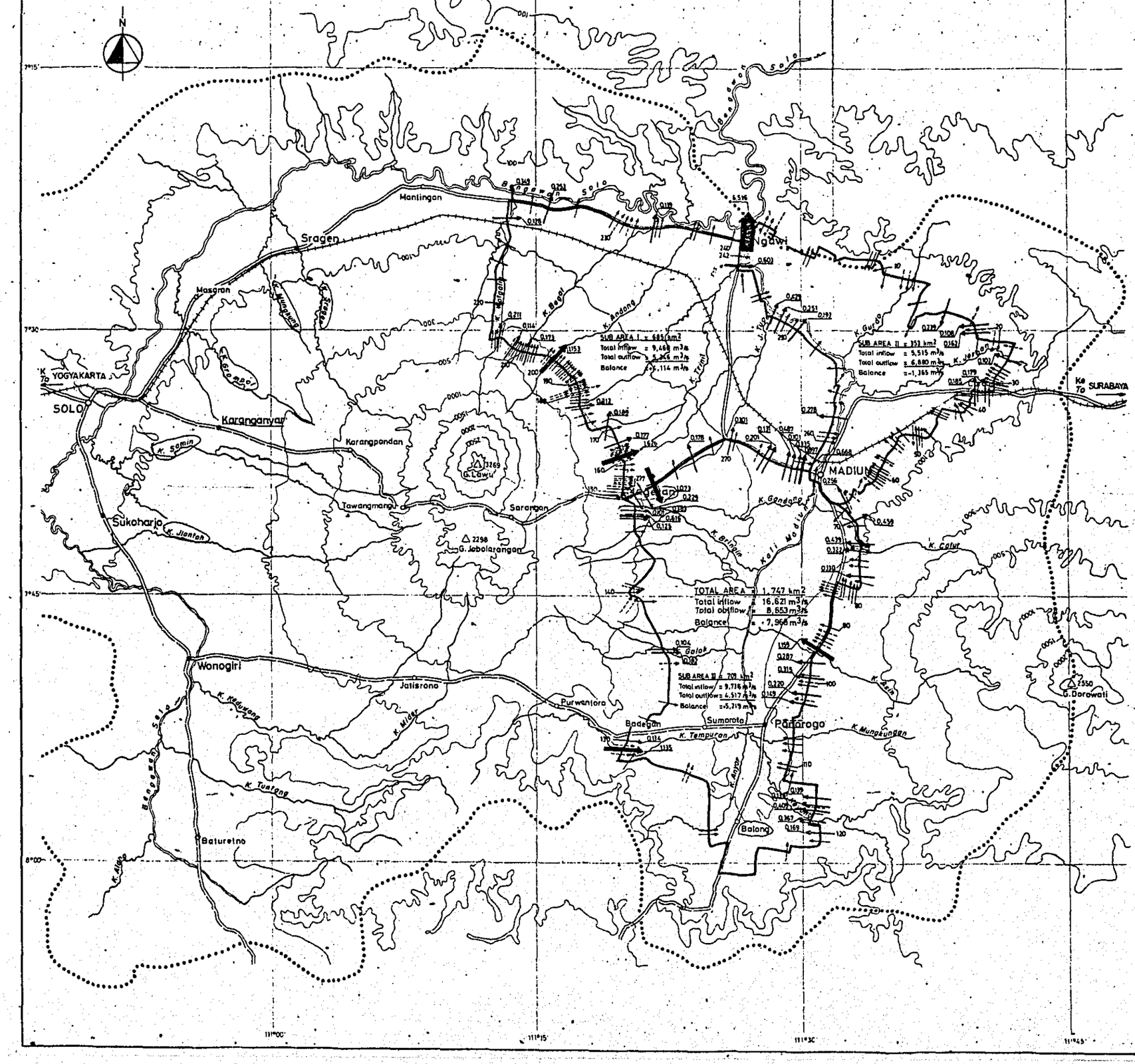
Date of Measurement	Stream No.	Stream	Discharge (m^3/s) Inflow	Outflow
30-8-1975	220	C	0.077	
	221	C	0.014	
	222	D		0.014
	223	R		0.035
	224	R	0.128	
	225	R		0.349
1-9-1975	226	D		0.021
	227	R		0.253
	228	D		0.099
	229	R		0.059
	230	R		0.005
	231	R		0.054
	232	D		0.001
	233	R		0.063
2-9-1975	234	R		0.139
	235	D		0.029
	236	R		0.079
	237	R		0.087
	238	D		0.047
	239	D		0.084
	240	D		0.065
	241	R		6.516
8-9-1975	242	D		0.058
	243	R		0.603
	244	R		0.014
	245	R		0.033
	246	R		0.010
	247	R		0.429
	248	R		0.257
	249	D		0.026
	250	D		0.001
	251	R		0.193
9-9-1975	252	R		0.053
	253	C	0.035	
	254	D		0.007
	255	C	0.018	

Data 5.1 (continued)

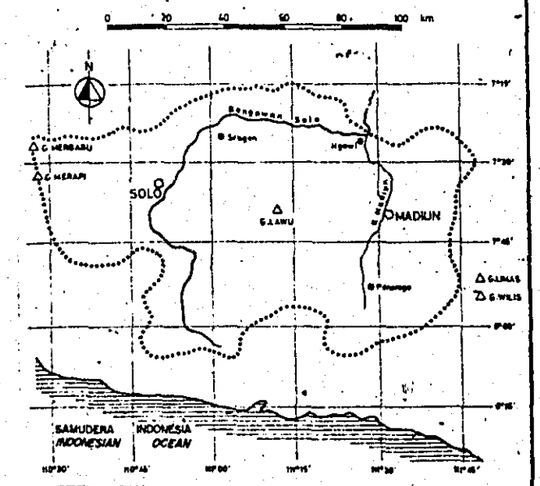
Date of Measurement	Stream No.	Stream	Discharge (m^3/s) Inflow	Outflow
9-9-1975	256	D		0.007
	257	C	0.278	
	258	D		0.036
	259	D		0.005
	260	D		0.081
	261	D		0.668
10-9-1975	262	C	0.897	
	263	C	0.355	
	264	C	0.101	
	265	C	1.487	
	266	C	0.131	
	267	R	0.201	
	268	C	0.001	
	269	R	0.011	
	270	C	0.101	
	271	C	0.054	
	272	C	0.178	
	273	C	0.049	
	274	C	0.065	

Notes: R = River
C = Canal/inflow
D = Drain/outflow

Data-5.2 Inflow and Outflow of The Flat Plain in Dry Season 1975



PETA PETUNJUK
KEY VIEW



KETERANGAN
LEGEND

- Batas daerah proyek — *Boundary of project area*
- Sungai — *River*
- Jalan kereta api — *Railway*
- Jalan kelas satu (Jalan Propinsi) — *1st class asphalted road*
- Jalan kelas dua (Jalan Kabupaten) — *2nd class asphalted road*
- Kota — *Town*
- Gunung — *Mountain*
- Jalan yang dilalui untuk penelitian aliran — *Passed route for stream investigation*
- Aliran yang ada dan arahnya — *Existing stream and its direction*
- Nomor pengukuran — *No. of measurement*
- Debit (Hanya untuk aliran yang debitnya lebih besar dari 0,1 m³/d) — *Discharge (Only for stream of which the discharge is more than 0,1 m³/s)*

DEBIT (m³/d)
DISCHARGE (m³/s)

0 — 0,010	1 — 2
0,010 — 0,100	2 — 3
0,100 — 0,500	3 — 4
0,500 — 1,000	4 — 5
	5 — 6
	6 — 7

0 4 8 12 16 20 km

REV No	REVISI REVISIONS	DRAWN	CHKD	APP'D	DATE

REPUBLIK INDONESIA
DEPARTEMEN PEKERJAAN UMUM DAN TENAGA LISTRIK
DIREKTORAT JENDERAL PENGAIRAN

SCALE —

SUB PROYEK PENGEMBANGAN AIR TANAH MADIUN-SOLO
GROUND WATER DEVELOPMENT PROJECT, MADIUN-UPPER SOLO WATERSHEDS

ALIRAN MASUK DAN ALIRAN KELUAR PADA DAERAH DATARAN DALAM MUSIM KEMARAU
INFLOW AND OUTFLOW OF THE FLAT PLAIN IN DRY SEASON, 1975

MAS
HID.6

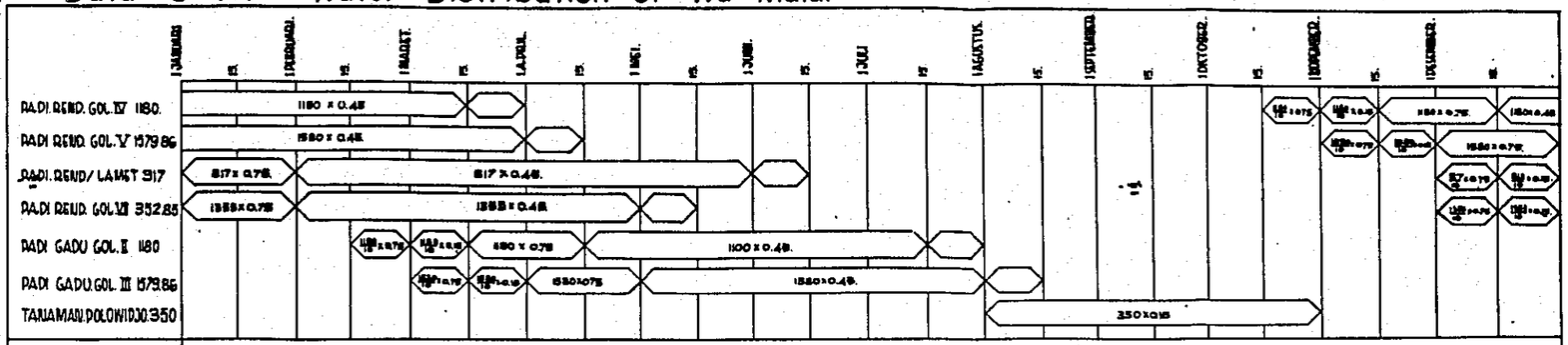
DIGAMBAR DRAWN	DIPERIKSA CHKD	DISETUJUI APP'D	TANGGAL DATE
			Sept 30 1975

elc-nk electroconsult nippon koei

Data 5.3 Crop Coefficients for Wet Paddy used in Other Project

	Location applied	Monthly Crop Coefficient					
		1	2	3	4	5	6
Modified Blonery - Criddle method.	Ciujung, Cisedone Rentong, Glapan Pedadi, etc.	0.90	1.10	1.35	1.20	0.90	0.40
	Jatiluhur. Gambarsari.	0.23	0.90	1.15	1.25		
	Pesanggrahan.	0.55 0.90	0.90 1.10	1.125 1.35	1.275 1.20	1.20 0.90	0.80
	Sala.	0.55 0.91	0.94 1.06	1.17 1.31	1.23 1.28	0.82 0.90	
	Umpu, Relitang.	0.77	1.07	1.33	1.34		
	Brantas.	0.55	0.15	1.10	0.50		
Hargreaves.	Bumbosa, Dumoga	0.90	1.40	1.50	1.40	0.40	
Penman.	Cimanuk.	1.10 1.10	1.35 1.35	1.30 1.20	1.05 0.50		
	Serayo.	1.00 1.00 0.01	1.10 1.15 1.14	1.30 1.30 1.28	1.30 1.10 1.19	0.90	

Data – 5.4.1 Water Distribution of Wd. Mulur



JUMLAH. –	KEBUTUHAN AIR. Ltr.																						
PADI REND. GOL. IV 1180.	531	531	531	531	531														60	18.	886	886	531
PADI REND. GOL. V 1579.86	711	711	711	711	711	711														119.	24.	1185.	1185.
PADI REND. LAMET. 817	618	618	368	368	368	368	368	368	868	368												61.	12.
PADI REND. GOL. VII 1352.85	1015	1015	609	609	609	609	608	609														101.	20.
PADI. GADU. GOL. II 1180.		-		89	18	885	885	531	531	531.	531.	531	531.										
PADI GADU. GOL. III 1579.86					119	24	1185	1185	711.	711	711.	711	711	711									
TANAMAN PALOWIJO. 350															53	53	53	53	53	53			
CATCH. AIR	2870	2870	2219	2308	2356	2597	3047	2693	1610.	1610.	1242.	1242	1242.	711	53	53	53	53	53	142.	137	909	2232.	1748.
CUSUTAN AIR DI SALAN %	718	718	555	577.	942	1039	1524.	1347	966	966	932	932	1243	711	106	106	106	106	106	426	274.	909.	886.	437.
JUMLAH KEBUTUHAN AIR.	3588	3588	2774.	2885	3298	3636	4571.	4040	2576	2576	2174.	2174.	2484.	1422	159.	159.	159.	159	159	568	411.	1818.	2790.	2185.
DEBIET DAM. PERSEN.	MULAI BULAN JANUARI % BULAN APRIL AIR TELAH CUKUP DARI PERSEN DARI AIR HUJAN								2532	2532	1926	1540	1860.	568	348.	286	164.	108.	53.	64.	729.	1864.	3200.	3200.
KEKURANGAN									44.	44.	248.	684.	1124.	854.				51.	76	504.				
KELEBIHAN.															189	77	5.				318.	46	410	1015.

SISA. m^3	4935000.	4935000	4935000.	4935000.	4935000	4935000	4935000	4935000	4877385	4817160.	4495749.	3674079.	2217369	1036783.	1281728	1388160.	1408810.	1342705.	1244200.	547480.	959620	1019245.	1850605.	2993741
(4) MENGISI m^3 dari Hujan									3281475	3300240	2496090	1965840	1763660	785200	481005.	326240.	224720.	139965.	1075625	83480	944780	2485760	4147200	4423680
(3) MENGELUARKAN m^3 dari Reservoir									3338490	3561056.	2817510.	2817510	3219270.	1965776	206070.	209808.	206070	206070	206070.	78200	532650	2398620.	3618540.	3022644.
KUMULATIF m^3	4935000	4935000	4935000.	4935000	4935000.	4935000	4935000	4935000	4877385	4817160.	4495749.	3674079.	2217369	1036783	1281728	1388160	1408810	1342705	1244200.	547480	959620	1019245.	1850605.	2993741

Volume (Kumulatif) m^3

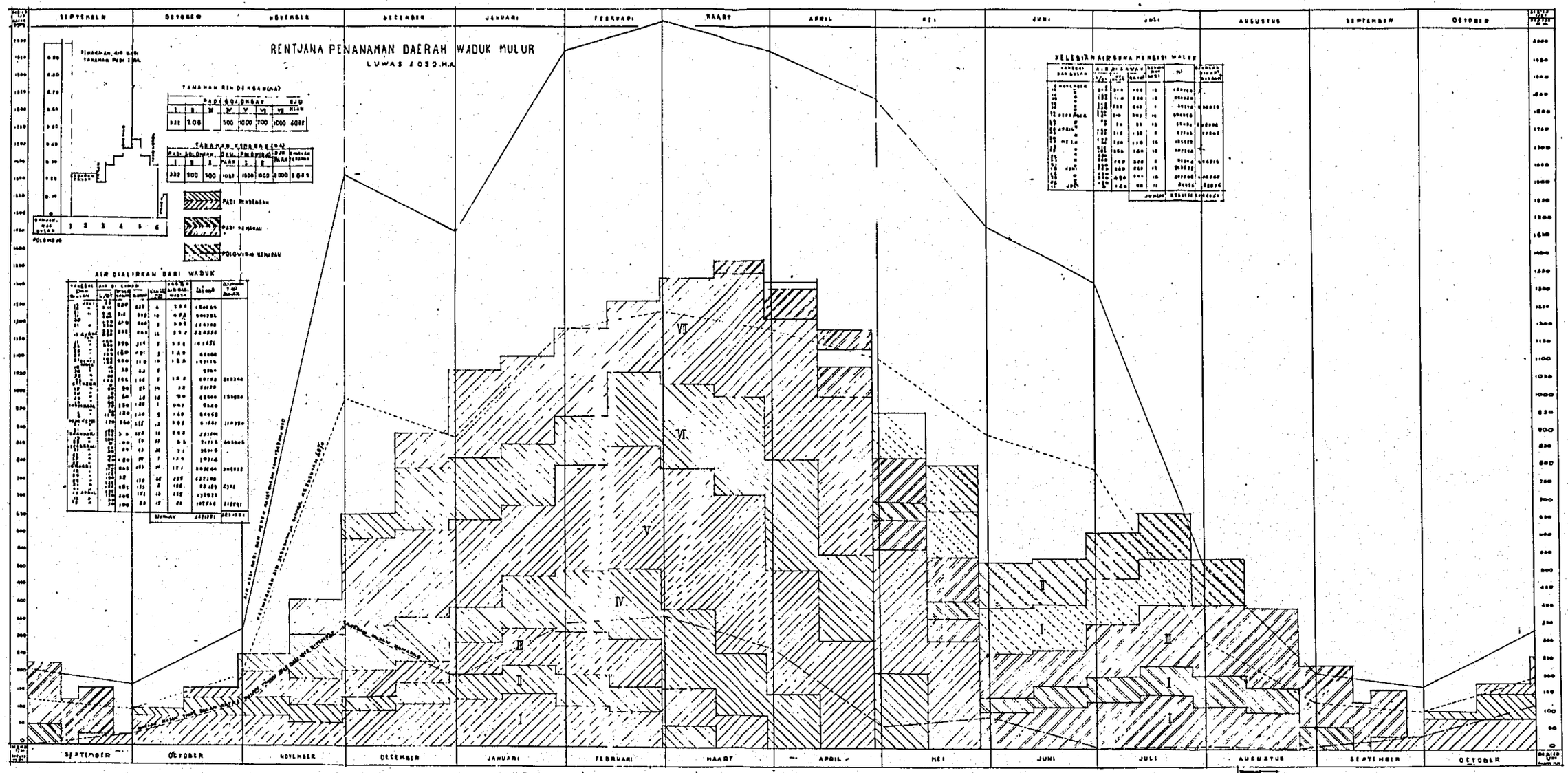
KETERANGAN

LUAS BARU CATCHMENT : 4876.58 HA
PEMBAGIAN AIR TELAH : 33.13 HA
ISI AIR : 493.500 m3.

SCHEMA EXPLOITASI WADUK MULUR
SUKOHARJO

DPU PROP. JATIM WIL. SURABAYA SEKSI KARANGANYAR	MENGETAHUI / SETUJUI KEPALA SUBSI	KEPALA SUBSEKSI PEMBAGIAN	DPU PIT WIL. SUNGAI SEKSI	
	Ir. SUSTIYUD	KATIDYO		

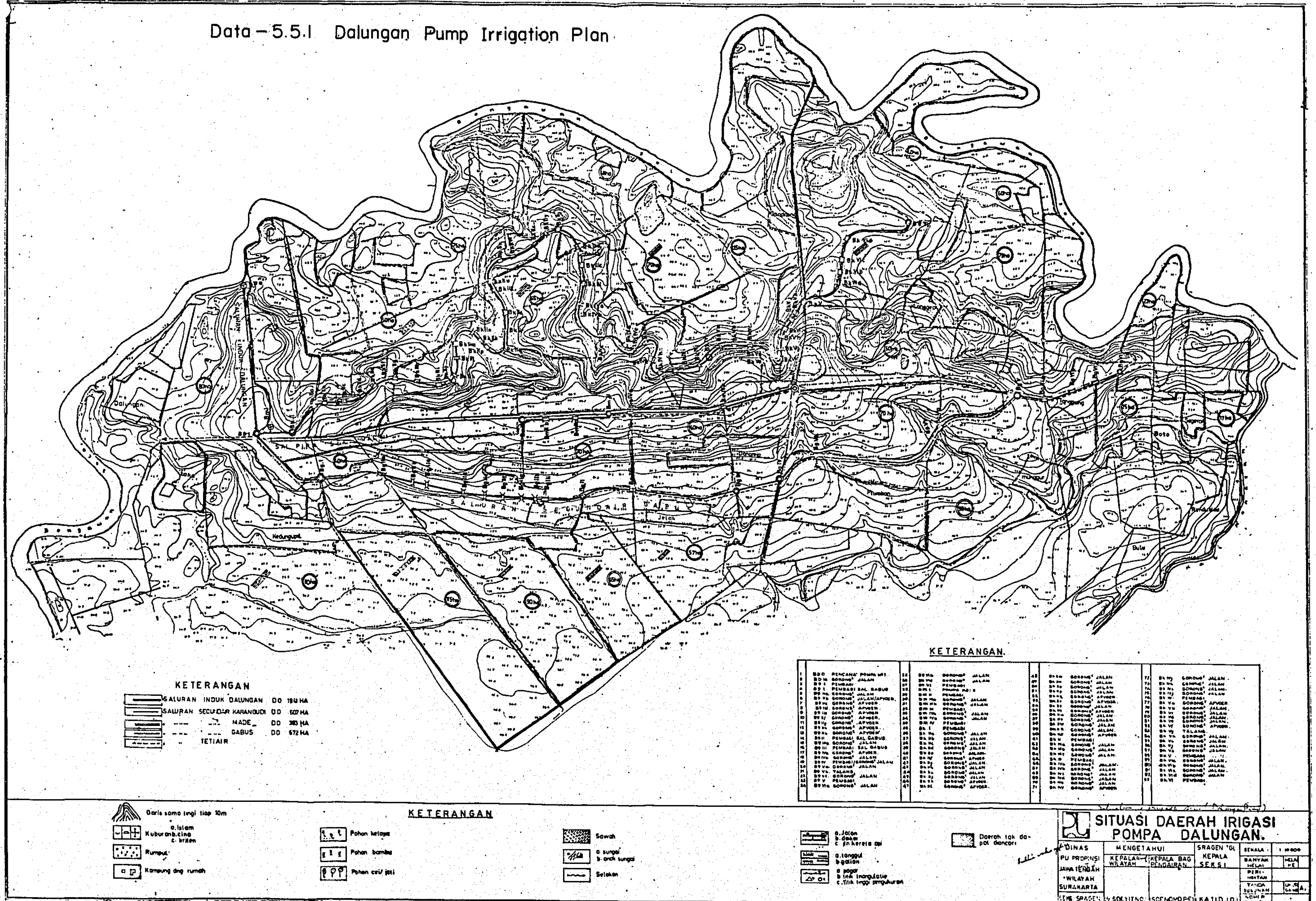
Data - 5.4.2 Water Distribution of Wd. Mulur



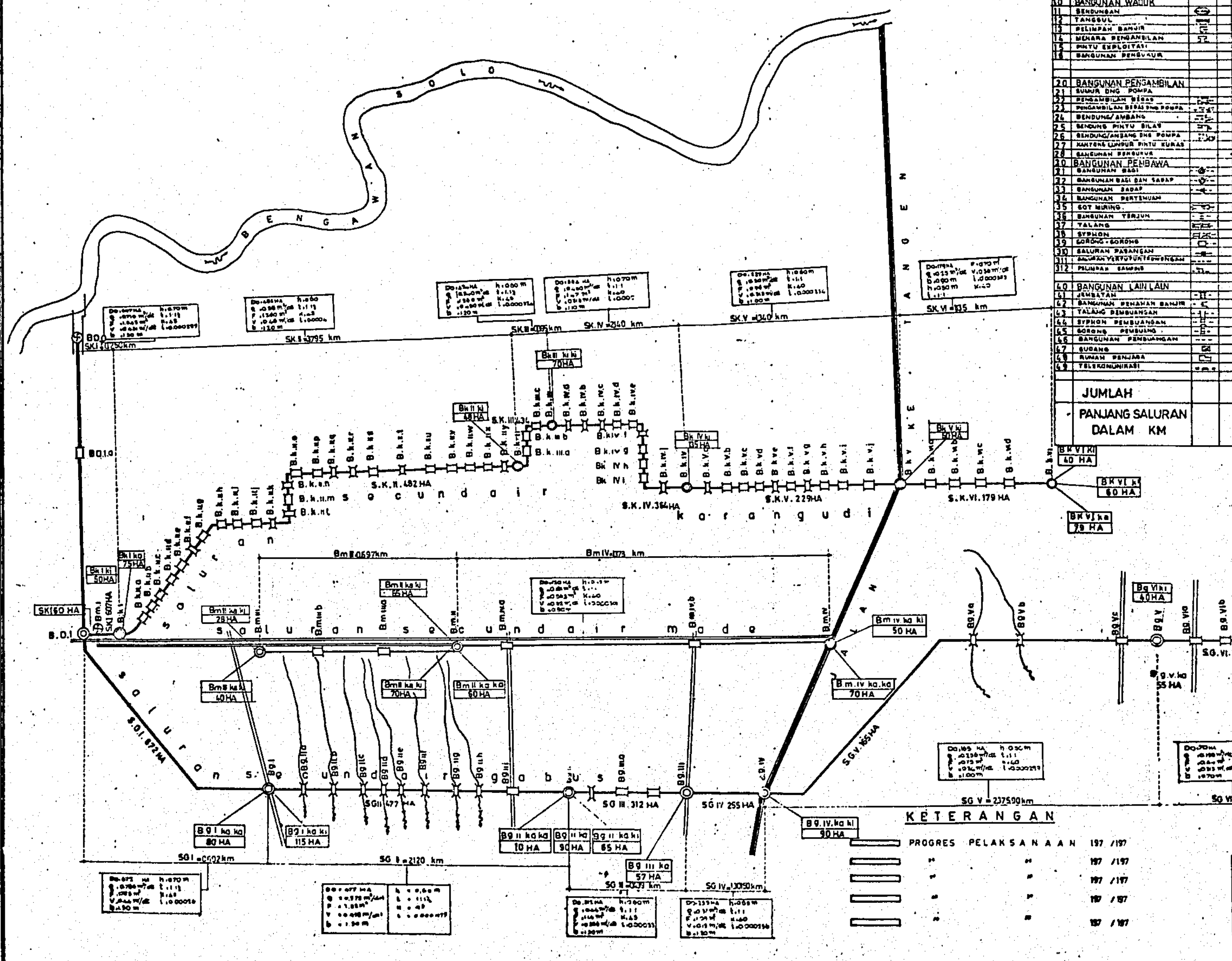
RENCANA PENANAMAN DAERAH WADUK MULUR
LUWAS 4032 HA

DINAS PEKERJAAN UMUM PROPINSI JAWA-TENGAH WILAYAH SURAKARTA SEKSI KARANGANYAR	MENGETAHUI/SETUJU		DINAS PEK. UMUM PROP JATENG WIL SURAKARTA SEKSI KR ANYAR	PERBAH UKURAN	THNDI 2000 PADA 1:2000
	KEPALA DINAS	KEPALA BAGPENGAIRAN		GAMBAR SELAI	
				PERI. HGATAN	
				SUSUNAN BANB	
			S M WIDJOJANTO DANOEWIRJOTO	NOMER URUT	

Data – 5.5.1 Dalungan Pump Irrigation Plan



Data-5.5.2 . Dalungan Pump Irrigation Plan



REKAPITULASI ADANYA BANGUNAN SALURAN DALAM DAERAH IRIGASI DALUNGAN

No.	Nama Bagian / Jenis Bangunan	Notasi Gambar	Waduk	Sal. Induk Dalungan	Sal. Sek. Karangudi	Sal. Sek. Made	Sal. Sek. Gabus	Jumlah Semua	Keterangan
10	BANGUNAN WADUK								
11	BENDUNGAN								
12	TANGGUL								
13	PELIMPAH BANJIR								
14	MENARA PENGAMBILAN								
15	PINTU EXPLOITASI								
16	BANGUNAN PENGUKUR								
20	BANGUNAN PENGAMBILAN								
21	SUMUR DNG POMPA			1		1		2	
22	PENGAMBILAN BEBAS								
23	PENGAMBILAN BEBAS DNG POMPA								
24	BENDUNG/AMBANG								
25	BENDUNG PINTU BILAS								
26	BENDUNG/AMBANG DNG POMPA								
27	KANTONG LUMPUR PINTU KURAS								
28	BANGUNAN PENGUKUR								
30	BANGUNAN PEMBAWA								
31	BANGUNAN BAGI			1	6	3	6	16	
32	BANGUNAN BAGI DAN SADAP								
33	BANGUNAN SADAP								
34	BANGUNAN PERTEMUAN								
35	GOT MIRING								
36	BANGUNAN TERJUN								
37	TALANG				1		1	2	
38	SYPHON								
39	GORONG - GORONG			1	36	4	7	48	
310	SALURAN PASANGAN								
311	SALURAN TERTUTUP/TEROWONGAN								
312	PELIMPAH SAMPING								
40	BANGUNAN LAIN LAIN								
41	JEMBATAN								
42	BANGUNAN PENAHAN BANJIR								
43	TALANG PEMBUANGAN								
44	SYPHON PEMBUANGAN								
45	GORONG PEMBUANG				15		10	25	
46	BANGUNAN PEMBUANGAN								
47	GUDANG								
48	RUMAH PENJAGA								
49	TELEKOMUNIKASI								
	JUMLAH			3	58	8	24	93	
	PANJANG SALURAN DALAM KM			1.261	9.055	5.481	8.036	23.456	

KETERANGAN

PROGRES PELAKSANAAN	197 /197
"	"	197 /197
"	"	197 /197
"	"	197 /197
"	"	197 /197

SUSUNAN DAERAH IRIGASI POMPA DALUNGAN

DINAS PU. PROPINSI JAWA TENGAH WILAYAH SURAKARTA	MENGETAHUI		SRAGEN, '91 KEPALA SEKSI	
SEKSI SRAGEN	IR SOEJITNO	SOENOMO BE	KATIDJO	

Data - 5.6

Comparison of Principal figures between
Fesibility Study in 1975 and this Study

Item		F/S (1976)		Pre. F/S (1975)
Plan and Study				
Irrigation Area		Right side area	19,600 ha	20,800 ha
		Left side area	3,600 "	2,800 "
		Total	23,200 "	23,600 "
Water Requirement Calculation Method		Hargreaves		Blaney-Criddle
Regional Cultivation Pattern		Three regions (Dengkeng, Karanganyar, Sragen)		One region
Rainfall Data		Daily rainfall data		Monthly rainfall data
Effective Rainfall		Paddy 69% - 71% Sugar Cane 55% - 68%		80%
Cropping Pattern Alternative		Three Alternatives ALT-1 Paddy-Paddy ALT-2 Paddy-Paddy-Polowijo ALT-3 Paddy-Paddy-1/2 paddy		One
Cropping Area		(ALT-3) Paddy Sugar Cane *Polowijo*	 19,000 ha 2,100 " 0 "	 15,800 ha 2,700 " 2,400 "
Water Requirement		(ALT-3)		(1967/68)
Max Diversion Requirement			29.4 m^3/sec	33.5 m^3/sec
Annual Diversion Requirement			483 million m^3	481 million m^3
Storage Capacity			397 million m^3	400 million m^3
Unit Design Discharge			(l/sec/ha)	(l/sec/ha)
		Entire project Area	1.270	1.420
		Karanganyar region	1.270	
		Sragen region	1.200	
		Dengkeng region	1.444	
Design Discharge		Intake	29.5 m^3/sec (23,200 ha)	33.5 m^3/sec (23,600 ha)
		Right	24.3 m^3/sec (19,600 ha)	29.55 m^3/sec (20,820 ha)
		Left	5.2 m^3/sec (3,600 ha)	3.95 m^3/sec (2,780 ha)
Colo weir	Location	One km dounstream (at right side)		Left side
	Intake	One intake site at the left side		Two intake site

Item	F/S (1976)	Pre. F/S (1975)
Plan and Study		
Operation and Maintenance of Main Canal	Use of wireless network Control to strengthen OM bridges and road system	Regulating reservoir
Preliminary Design		
Colo Diversion Weir		
Upstream end	103.0 m SHVP	104.0 m SHVP
Downstream end	80.5 "	80.0 "
River bed E.L	99.0 "	100.0 "
Crest of Weir	108.0 "	107.6 "
Intake Water Level	107.0 "	106.5 "
Height of weir	9.0 m	7.6 m
Main Canal		
Total length	93.80 Km	89.50 Km
Right	62.40 "	63.90 "
Left	31.40 "	25.60 "
Main Canal Facilities		
Turn out	48	49
Check gate	13	6
Siphon	28	17
Aqueduct	16	16
Culvert	14	105
Crossiphon	139	-
Bridge	270	183
Measurement facility	4	-
Secondary Canal	(Rehabilitation)	
Total length	41.20 Km (40.00 Km)	112.20 (32.70)
Right	31.60 (38.00)	100.10 (31.70)
Left	9.60 (2.00)	12.10 (1.00)
Farm Canal		
Total	928.00 Km	944.00 Km
Existing	316.80 " (13.7 m/ha)	236.00 (10 m/ha)
New	611.20 " (26.3 m/ha)	708.00 (30 m/ha)
Cost Total	46,200,000 US$	33,100,000 US$
Foreign	23,490,000	16,770,000
Local	22,710,000	16,330,000
Increased percentage	+ 39.6%	
Unit Cost US$/ha	1,991 US$/ha	1,403 US$/ha
Up ratio	+ 41.9%	

Data 5.7.1 Result of Water quality

Places of sampling	Temperature °C		Soluble oxygen (ppm)	CO_2 (ppm)	Alkalinity (ppm)			Total hotel-lime (ppm)	pH	D.S ppm
	Air	Water			P.P.	M.O.	Total			
1	28.0	27.0	6.60	7.0	-	-	-	185	7	150
2	31.0	32.0	6.20	5.0	-	-	-	170	7	200
3	30.0	32.0	6.20	6.0	-	-	-	160	7	150
4	26.0	27.0	7.20	7.0	-	39.0	39.0	185	7	150
5	31.0	32.0	6.15	7.0	-	42.0	42.0	160	7	200
6	31.0	32.0	6.15	7.0	-	41.0	41.0	160	7	150
7	23.0	27.0	6.64	6.5	-	118.0	118.0	155	7	200
8	30.0	34.0	5.80	6.0	-	123.0	123.0	175	7	150
9	23.5	27.0	6.60	6.5	-	118.0	118.0	155	7	150
10	30.0	34.0	5.80	6.0	-	123.0	123.0	175	7	150
11	28.5	30.0	6.60	9.5	-	50.0	50.0	137	7	200
12	27.0	29.0	6.80	10.5	-	50.0	50.0	145	7	200
13	30.0	30.0	6.60	12.0	-	57.0	57.0	175	7	200
14	28.5	30.5	6.55	13.0	-	13.0	13.0	160	7	200
15	27.0	29.0	6.85	17.6	-	12.0	12.0	165	7	200
16	30.0	30.0	6.60	12.0	-	10.5	10.5	170	7	200
17	29.0	26.0	6.80	17.6	-	13.0	13.0	90	7	200

Explanation :

1)) Bengawan Sala, June 30, 1975 (morning
2) (noon
3) (after noon
4)) Keduang river, (Tempuran) June 30, 1975 (morning
5) (noon
6) afternoon
7)) Bengawan Sala, September 4, 1975 (morning
8) September 5, 1975 (noon
9)) Keduang river (Tempuran) September 4, 1975 (morning
10) September 5, 1975 (noon
11)) Bengawa Sala, November 21, 1975 (afternoon
12) November 22, 1975 (morning
13) November 22, 1975 (noon
14)) Keduang river (Tempuran) November 21, 1975 (after noon
15) November 22, 1975 (morning
16) November 22, 1975 (noon
17) Keduang river November 31, 1975 (morning

P.P. : Phenolphtalein.

M.O. : Methyl Orange.

D.S. : Dissolved Solids.

Source : Biological Report, Faculty of Biology Gadjah Mada University, Mart 1976.

Data 5.7.2 Result of Water Quality

Places of Sampling	Temperature °C		Soluble oxygen (ppm)	CO_2 (ppm)	Alkalinity (ppm)			Total betel-lime (ppm)	pH	D.S. ppm
	Air	Water			P.P.	M.O.	Total			
1	23.0	24.0	8.60	5.5	-	-	-	160	7	200
2	31.0	32.0	6.20	4.5	-	-	-	170	7	200
3	31.0	32.0	6.25	10.5	-	-	-	150	7	200
4	23.0	24.0	6.60	5.5	-	-	-	160	7	200
5	32.0	33.0	6.00	4.5	-	-	-	170	7	200
6	32.0	33.0	6.00	10.5	-	-	-	150	7	200
7	29.0	30.0	6.65	5.0	-	154	154	200	7	200
8	22.0	23.5	8.65	5.0	-	154	154	200	7	200
9	29.0	30.0	6.60	15.0	-	34	34	200	7	200
10	23.0	26.0	7.40	17.6	-	33	33	175	7	200
11	25.0	26.5	7.30	12.0	-	120	120	165	7	150
12	31.0	30.0	6.68	12.0	-	131	131	175	7	150
13	30.0	31.0	6.40	12.0	-	133	133	175	7	175
14	24.0	25.0	7.90	13.5	-	42	42	27.5	7	150
15	30.0	29.0	6.85	8.5	-	60	60	60	7	150
16	29.0	31.0	6.45	10.0	-	62	62	60	7	175
17	24.0	26.0	7.40	14.0	-	18	18	150	7	200
18	29.0	33.0	6.00	4.5	-	17	17	160	7	200
19	24.0	26.0	7.35	12.5	-	57	57	145	7	200
20	29.0	33.0	6.00	12.5	-	65	65	180	7	200

Explanation :

1) 2) 3)) Bengawan Sala, July 1, 1975 (morning (noon (afternoon

4) 5) 6)) Wiroko River, July 1, 1975 (morning (noon (afternoon

7) 8)) Bengawan Sala, September 5, 1975 (afternoon; September 6, 1975 (morning

9) 10)) Wiroko River, September 5, 1975 (afternoon; September 6, 1975 (morning

11) 12) 13)) Bengawan Sala, October 27, 1975 (morning (noon (afternoon

14) 15) 16)) Wiroko River, October 27, 1975 (morning (noon (afternoon

17) 18)) Bengawan Sala, November 23, 1975 (morning; November 22, 1975 (afternoon

19) 20)) Wiroko River, November 23, 1975 (morning; November 22, 1975 (afternoon

P.P. : Phenolphtalein.
M.O. : Methyl Orange.
D.S. : Dissolved Solids.

Source : Biological Report, Faculty of Biology Gadjah Mada University, Mart 1976.

Data 5.7.3 Result of Water Quality

Places of sampling	Temperature °C		Soluble oxygen (ppm)	CO_2 (ppm)	Alkalinity (ppm)			Total betel-lime (ppm)	pH	D.S ppm
	Air	Water			P.P.	M.O.	Total			
1	27.0	25.0	8.05	11.0	-	45	45	155	7	200
2	32.0	32.0	6.20	9.0	-	105	105	150	7	200
3	29.0	31.0	6.40	15.0	-	42	42	170	7	200
4	23.0	25.0	8.20	12.76	-	49	49	160	7	200
5	31.0	31.0	6.35	15.40	-	47	47	170	7	200
6	28.0	32.0	6.25	13.20	-	47	47	160	7	200
7	25.0	26.5	7.30	8.0	-	33.5	33.5	80	7	100
8	30.5	28.5	6.90	7.50	-	33.5	33.5	85	7	125
9	28.0	31.0	6.40	5.25	-	32.5	32.5	62.5	7	125
10	25.0	26.0	7.50	6.75	-	40	40	175	7	125
11	24.5	26.5	7.25	15.20	-	75	75	165	7	200
12	30.0	29.0	6.80	8.50	-	70	70	200	7	200
13	29.0	32.0	6.20	7.75	-	70	70	225	7	250
14	25.0	26.0	7.45	7.50	-	81	81	227.50	7	100
15	23.0	25.0	7.80	13.25	-	33	33	260	7	100
16	28.0	26.0	7.40	11.75	-	30	30	270	7	110
17	26.5	28.0	6.95	12.50	-	30	30	200	7	110
18	24.0	24.5	8.30	17.0	-	50	50	322.5	7	110
19	31.0	29.0	6.78	12.75	-	51.5	51.5	387.5	7	110
20	28.0	30.0	6.65	15.0	-	54	54	250	7	175
21	23.5	25.0	7.84	10.0	-	31	31	247.5	7	110
22	30.5	29.0	6.80	10.0	-	40	40	272.5	7	100
23	26.5	28.0	7.00	13.50	-	40	40	212.5	7	100
24	26.0	24.0	7.50	20.0	-	61.5	61.5	222.5	7	110
25	29.0	29.5	6.75	10.0	-	60	60	260	7	200
26	27.0	30.0	6.62	10.0	-	60	60	250	7	200

Explanation :

1 Bengawan Solo, July 2, 1975 morning.
2 Bengawan Solo, July 2, 1975 noon.
3 Bengawan Solo, July 2, 1975 after noon.
4 Gunting River, July 2, 1975 morning.
5 Gunting River, July 2, 1975 noon.
6 Gunting River, July 2, 1975 afternoon.
7 Bengawan Solo, December 5, 1975 morning.
8 Bengawan Solo, December 5, 1975 noon.
9 Bengawan Solo, December 5, 1975 after noon.
10 Bengawan Solo, December 6, 1976 morning.
11 Gunting River, December 5, 1975 morning.
12 Gunting River, December 5, 1975 noon.
13 Gunting River, December 5, 1975 after noon.
14 Gunting River, December 6, 1975 morning.
15 Bengawan Solo, December 30, 1975 morning.
16 Bengawan Solo, December 30, 1975 noon.
17 Bengawan Solo, December 30, 1975 after noon.
18 Gunting River, December 30, 1975 morning.
19 Gunting River, December 30, 1975 noon.
20 Gunting River, December 30, 1975 after noon.
21 Bengawan Solo, December 31, 1975 morning.
22 Bengawan Solo, December 31, 1975 noon.
23 Bengawan Solo, December 31, 1975 after noon.
24 Gunting River, December 31, 1975 morning.
25 Gunting River, December 31, 1975 noon.
26 Gunting River, December 31, 1975 after noon.

P.P. : Phenol phthalein.
M.O. : Methyl Orange.
D.S. : Disolved Solids.

Source : Biological Report Faculty of Biology Gadjah Mada University, Mart 1976.

Data 5.7.4 Result of Water Quality

Places of sampling	Temperature °C		Soluble oxygen (ppm)	CO_2 (ppm)	Alkalinity (ppm)			Total betel-lime (ppm)	pH	D.S. ppm
	Air	Water			P.P.	M.O.	Total			
1	26.0	25.0	7.90	18.66	-	35	35	175	6	150
2	29.5	28.5	6.90	17.60	-	33	33	175	6	150
3	28.5	29.0	6.80	14.78	-	32	32	150	7	150
4	29.5	27.5	7.10	15.00	-	200	200	125	7	150
5	28.0	34.0	5.70	6.00	-	114	114	170	7	150
6	25.5	27.0	7.25	9.00	-	47	47	50	7	100
7	29.0	36.0	5.40	9.00	-	80	80	52.5	7	100
8	28.0	27.0	7.20	12.50	-	47	47	75	7	50
9	29.0	28.5	6.95	13.00	-	93	93	310	7	300
10	27.0	29.0	6.80	12.50	-	97	97	300	7	250
11	25.0	28.5	6.90	15.25	-	21	21	67.5	6	100
12	31.0	30.0	6.60	10.50	-	37	37	32.5	6	100
13	27.0	26.8	7.30	16.00	-	8.5	8.5	50	6	150
14	28.0	29.5	6.70	7.50	-	16	16	50	7	100
15	24.8	25.5	7.50	20.20	-	10	10	50	7	100
16	30.0	27.0	7.20	18.70	-	10	10	50	7	100
17	30.0	29.0	6.80	11.00	-	21	21	120	7	150

Explanation :

1 morning.
2 Kajen (Wonogiri), August 2, 1975 noon.
3 afternoon
4 Rawa Jambe, September 4,1975 morning.
5 Keduang River (Dlepih), September 7, 1975 morning.
6 Tirtomoyo River, October 26, 1975 morning.
7 Gede River (Batuwarno), October 26, 1975 morning.
8 Klanting River (Selomoyo), October 26, 1975 noon.
9 Ngravan River (Eromoko), November 23, 1975 morning.
10 Wuryantoro River, November 23, 1975 morning.
11 Wiroko River (Sumbung), December 4, 1975 morning.
12 Keduang River, December 54, 1975 noon.
13 Tirtomoyo River, December 6, 1975 morning.
14 Gede River (Batuwarno), December 6, 1975 noon.
15 Plumbon Reservoir, December 6, 1975 noon.
16 Balong Dam, December 31, 1975 morning.
17 Wuryaantoro River, December 31, 1975 noon.

P.P. : Phenolphthalein.
M.O. : Methyl Orange.
D.S. : Dissolved Solids.

Source : Biological Report, Paculty of Biology Gadjah Mada University, Mart 1976.

Data 5.7.5 Analytical results of Bengawan Sala Water Sample (p.p.m.)

Item	August, 1973	October, 1973
Specific conductance uu / cm (25°C)	414	267
Ca	34.0	29.3
mG	10.4	7.3
Na	30.0	12.1
K	4.60	2.68
Alkalinity as $CaCo_3$	151	117
SO_4	6.9	10.3
Cl	31.0	4.2
SiO_2	28.0	17.0
Fe	0.0	0.0
PO_4 - P	0.300	0.003
NO_3 - N	1.84	0.0
NH_4 - N	0.04	0.01
Sr	0.26	0.24
F	0.20	0.30
COD	4.2	2.1
Dissolved Solids	267	169
Suspended Solids	96.7	190
Turbidity	33.7	210
pH.	7.2	7.2

Source : D.P.M.A. Bandung.

Data 5.7.6 Result of Water quality measuring at Laboratory

Examination	Symbol	Unit	Result		
			No.1	No.2	No.3
Fysic :					
Colour	-	Skala Pt-Co	30	50	140
Taste	-	-	-	-	-
Smell	-	-	-	-	-
Turbidity	-	mg/L.SiO_2	73.0	405.0	835.0
Temperatur air/water	-	^oC	-	-	-
Chemist :					
Acidity degree	pH	-	7.6	7.0	7.3
Bicarbonate	HCO_3	mg/L	122.0	48.8	94.6
Carbon dioxyde at place	CO_2	mg/L	6.5	8.7	6.5
Ammonia	NH_4	mg/L	0.4	0.6	0.2
Organic matter	$KMnO_4$	mg/L	23.8	52.4	58.7
Total betel-lime	-	^o_d	6.3	2.4	4.9
Calcium	Ca	mg/L	25.9	10.1	27.0
Magnecium	Mg	mg/L	11.6	4.1	4.8
Total iron	Fe	mg/L	0.2	7.5	14.0
Manganese	Mn	mg/L	0.0	0.44	1.1
Cooper	Cu	mg/L	trace	trace	trace
Fluor	F	mg/L	0.4	0.3	0.4
Nitrit	NO_2	mg/L	0.1	trace	trace
Chloride	Cl	mg/L	3.0	2.0	3.5
Sulfate	SO4	mg/L	2.6	10.3	5.15
Conductivity	DHL	umh os/cm	270	110	180

Explanation :

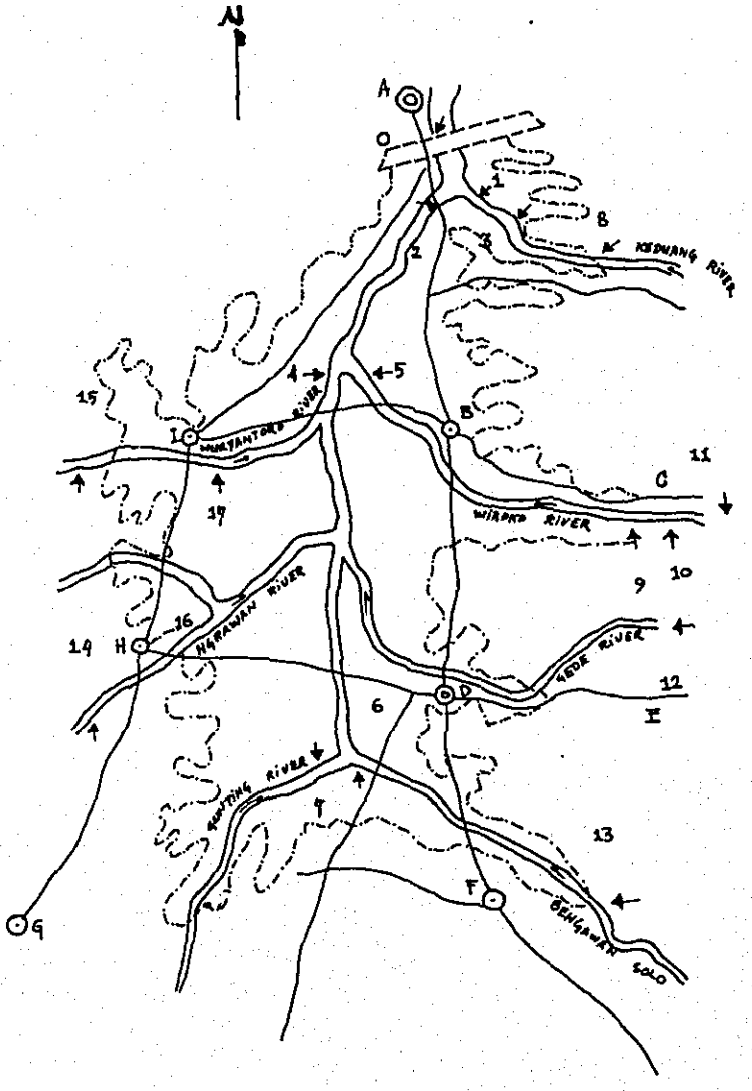
No. 1 : Water Sample from Wuryantoro river at 03.00 p.m.
Wonogiri December 31, 1975.

No. 2 : Water sample from Balong Dam at 11.00 a.m.
Wonogiri December 31, 1975.

No. 3 : Water sample from Tempuran at 09.00 a.m.

Source : Biological Repport
Faculty of Biology, Gadjah Mada University Mart, 1976.

Data 5.7.7 Sampling Site



SCHEME OF WATER SAMPLE AND PLANCTON SAMPLE TAKING OVER PLACE.

PLACES OF SAMPLING :

0. BENGAWAN SOLO (KAJEN, NEAR WONOGIRI).
1. ESTUARY OF KEDUANG RIVER IN BENGAWAN SOLO. (TEMPURAN).
2. BENGAWAN SOLO (SOMO HULUN).
3. KEDUANG RIVER.
4. BENGAWAN SOLO (TUKUL).
5. WIROKO RIVER. (TUKUL).
6. BENGAWAN SOLO (PANGKAH).
7. GUNTING RIVER. (PANGKAH).
8. KEDUANG RIVER. (DLEPIH).
9. BALONG DAM (AT WIROKO RIVER, TIRTOMOYO).
10. WIROKO RIVER (SUMBUNG).
11. WIROKO RIVER (TIRTOMOYO).
12. GEDE RIVER (BATUWARNO).
13. BENGAWAN SOLO (SELOMOYO).
14. PLUMBON RESERVOIR (EROMOKO)
15. ROWO JAMBE (WURYANTORO).
16. NGRAWAN RIVER (EROMOKO).
17. WURYANTORO RIVER (WURYANTORO).

EXPLANATION :

: RIVER.

: ROAD.

⊙ : TOWN.

→ : PLACES OF SAMPLING.

A : WONOGIRI (KADUPATEN).
B : NGUNTORONADI.
C : TIRTOMOYO.
D : BATURETNO.
E : BATUWARNO.
F : GIRI WOYO.
G : PRACIMANTORO.
H : EROMOKO.
I : WURYANTORO.

Data-6. GEOLOGY

6. GEOLOGY

The test drilling was undertaken to locate the Colo weir and to know the geology of sites where aqueducts and syphons are to be built as part of the main canal for irrigation purpose and gate facilities for river training.

The number of drilling holes and the total drilling depth are six (6) holes with 180 m at the Colo weir-site, four (4) holes with 90 m for aqueducts and syphons and six (6) holes with 130 m for gate facilities.

Fig 6.1 and 6.2 show the location of the drilling holes. The geological records of the drilling holes are compiled in Appendix III.

6.1 GEOLOGY OF COLO WEIR-SITE

The geology of the Colo weir-site is divided into two layers : one is the bed rock of the volcanic clastic rock of the Miocene epoch and the other the upper layer of similarly volcanic clastic rock presumed to be of the Pliocene-Pleistocene formation.

The bed rock consists of lapilli tuff, tuff breccia and volcanic breccia, and the upper layer tuff breccia. The tuff breccia of the upper layer is less solidified and, accordingly, softer than the bed rock.

A hill seen on the left bank of the Bengawan Sala near the Colo weir-site is made up of the Miocene volcanic clastic rock, while an extensive area of gently sloping terrace on the right bank of the River is covered with the tuffaceous clay. The quaternary river deposit mingled with sand and clay has developed low terraces to the thickness of some twenty (20) meters on the both banks of the River.

The following is the description of the geology of the proposed sites for Colo-weir Construction.
The Colo weir-site proposed during the Wonogiri-Dam Feasibility-Study (1975) is designated as Site A, while three alternative sites proposed under the current feasibility study (1976) are named Site B, Site C, and Site D, from the upstream downwards.

At Site A, terrace deposit consisting of sand and clay exists in the thickness of some 20 meters on the stratum of the younger volcanic clastic rock of the tuff and lapilli tuff.

At Site B, terrace deposit consisting of sand, silt and clay lies in the thickness of approximately 20 meters on the stratum composed of clayey and/or sandy tuff. The terrace deposit, in its lower part, is compact with the stiffened clay and silt.

While the lower part is unweathered and hard, the upper part turns partially soft and, as it approaches the top soil, is weathered and soft to an unsuitable degree as a structural foundation formation. The weathered part has a thickness ranging from four (4) meters to ten (10) meters with a tendency of increasing its thickness as it proceeds from the inland side towards the River.

At Site D, the bed rock consists of the younger volcanic clastic rock, of which the upper part is mainly made up of tuff and the lower part, lapilli tuff and tuff breccia.

A weathered layer overlies the bed rock in the thickness of about 5 meters.

Fig 6.3 presents the geological profile at Sites B, C, and D.

At both Sites A and B, the terrace deposit is judged to lack such a bearing capacity as is called for the weir foundation. To overcome this shortcoming, it is necessary to adopt a pile foundation supported with a gravel layer at the lowest part of the deposit or the bed rock.

Both Sites C and D offer favorable footing foundation for the Colo weir. The existence of the weathered zone of a considerable depth at Site C, however, will necessitate its removal through partial deep excavation. On the other hand, Site D has only a thin weathered zone and a dependable foundation rock consistent with design requirement is made available for the entire footing area of the weir.

From the geological point of view, Site D presents the most favorable foundation formation for the construction of the Colo weir.

6.2 GEOLOGY OF THE PROPOSED SITES FOR AQUEDUCTS, SYPHONS AND GATE FACILITIES

Generally the geological aspect of the Project area is described as follows.

The hilly area existing from the neighborhood of the Colo weir-site southwards mainly consists of the Miocene volcanic detritus.

On the gently sloping terrace at the foot of G. Lawu, a line may be drawn in the vicinity of K. Samin to divide the area into the south and the north; while the old Quaternary volcanic products due to volcanic action in the later Pleistocene Age are found in the south, the young Quaternary volcanic products through volcanic action in the more recent Holocene Epoch are witnessed in the north.

Alluvial layer is seen in the low-lying area along the Bengawan Sala river from the Colo weir-site to the vicinity of Surakarta as well as in comparatively wider area in the K. Dengkeng river.

The following is description of the general geological aspect of the proposed sites for aqueducts, syphons and gate facilities.

The geological structure of the sub-surface formation of the Project area has a remarkable local variation wrought in the process of its formation.

In comparatively large tributaries such as K. Dengkeng and K. Samin, fluvial deposit is sorted into sand and clay of alluvial nature in the thickness of several meters, overlying the volcanic products./1

In other area excepting the fluvial-deposit area, unconsolidated tuffaceous clay spreads immediately below the thin top soil. As it goes lower, the tuffaceous clay turns into stiffer tuff or tuff breccia. The thickness of the tuffaceous clay has a considerable variation from place to place. The tuffaceous clay does not seem to have a bearing capacity large enough to support a concrete structure. A semi-consolidated tuff or tuff breccia also has a verying degree of stiffness : for instance, at the drilling holes Nos. IB2 and RB4 along K. Jlantah, tuff or tuff breccia encountered there has the thickness of 5 to 6 meters but their stiffness varies to a considerable extent.

Generally speaking, shallow footing foundation may not be suitable. Deep pile foundation is recommendable.

/1 See Drilling holes Nos. IB1, IB3 and RB6.

FIG 6-1 Location of Drilling Holes at Colo Weir-Site

S = 1 : 5000

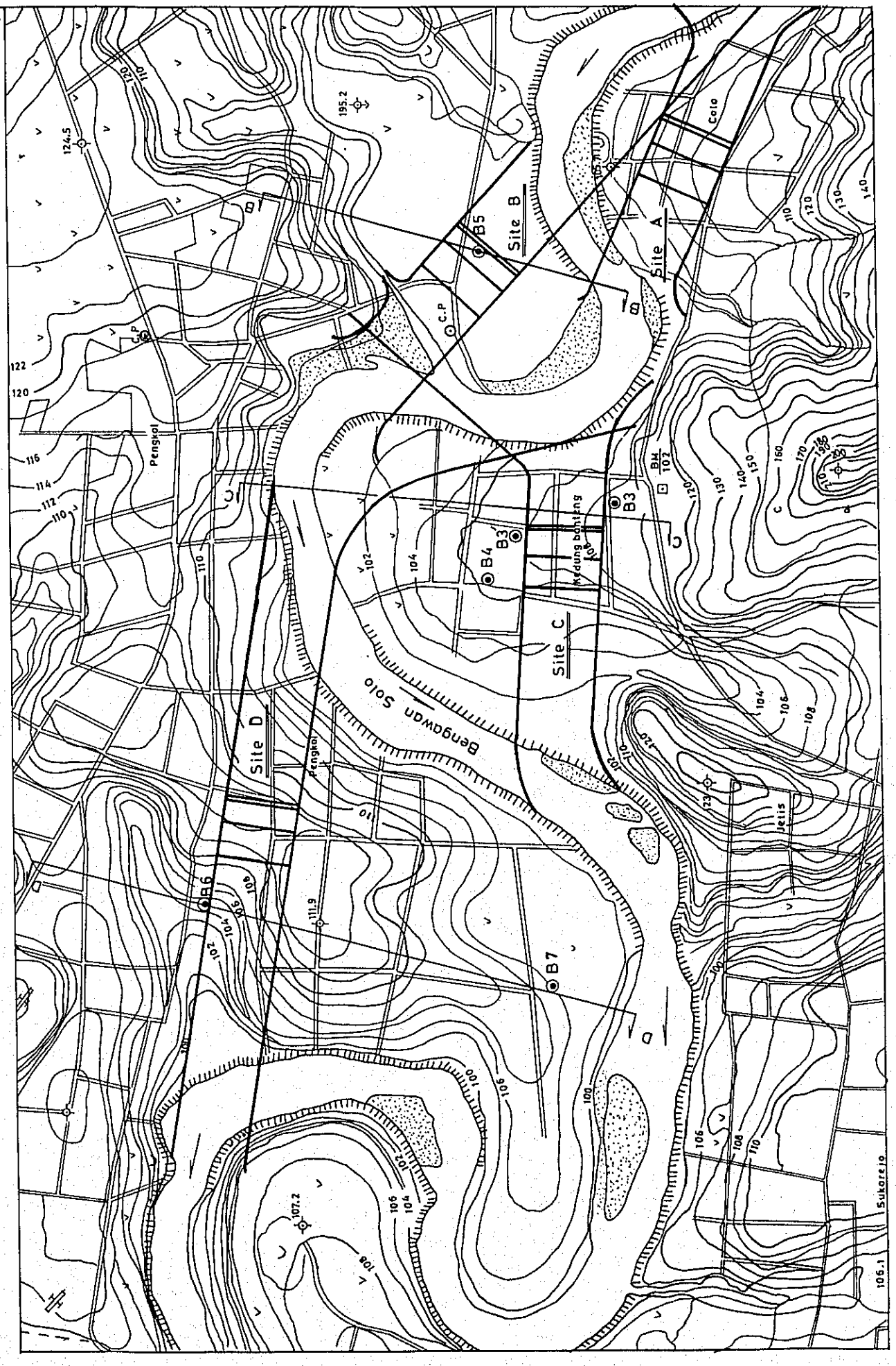


FIG 6-2 Location of Drilling Halesat Sites Proposed for The Construction of Agueducts Syphons and Gate Facilities

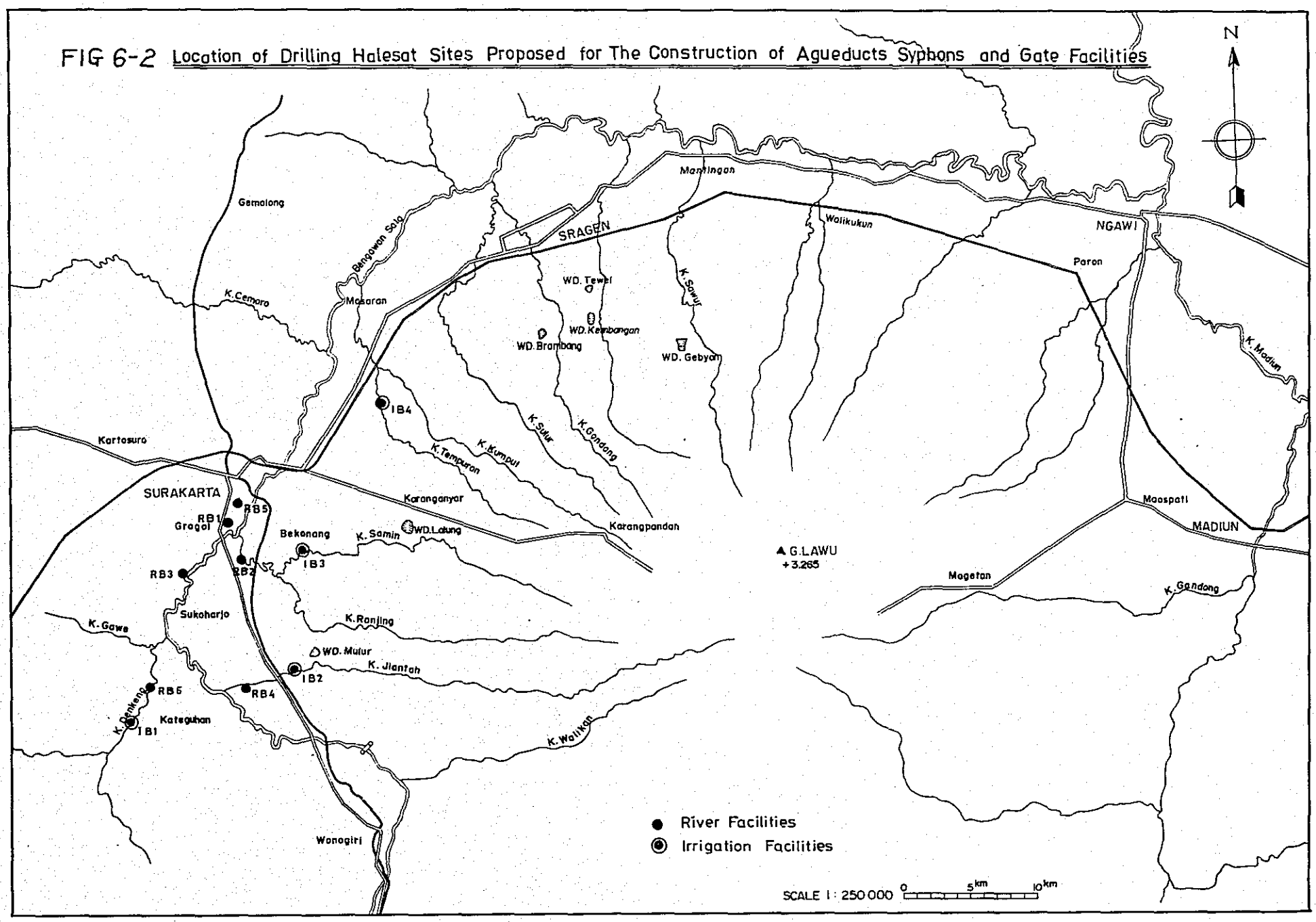


FIG 6-3 GEOLOGICAL PROFIL AT SITES B.C & D. (2)

VERTICAL SKALA 1: 500
HORIZONTAL SKALA 1: 2000

SITE . D

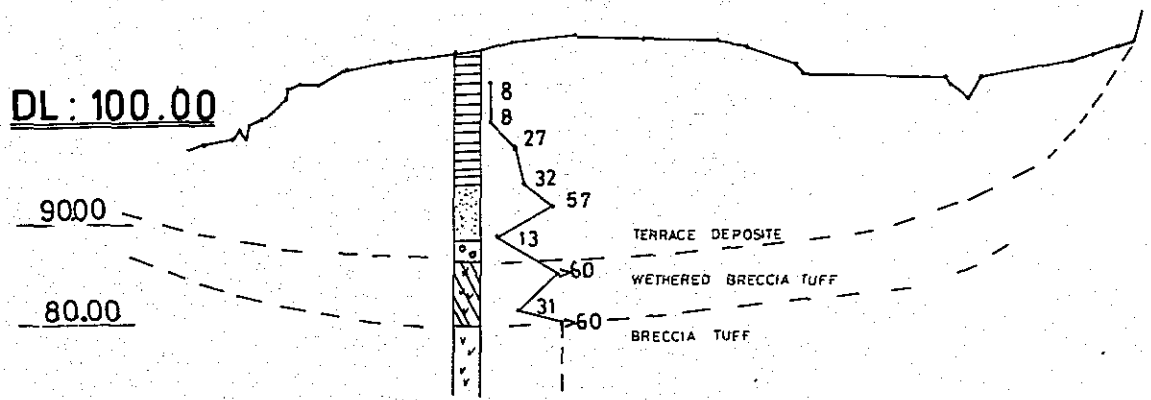
SECTION D - D

FIG 6-3 GEOLOGICAL PROFILE AT SITES B, C & D (1)

VERTICAL SKALA 1 : 500
HORIZONTAL SKALA 1 : 2000

SITE · B

SECTION B - B



SITE C

SECTION C - C