Lampiran 1. Hasil Turnitin

Optimasi Pengelolaan Air Bendung Cawak Untuk Daerah Irigasi Cawak Dengan Program Solver

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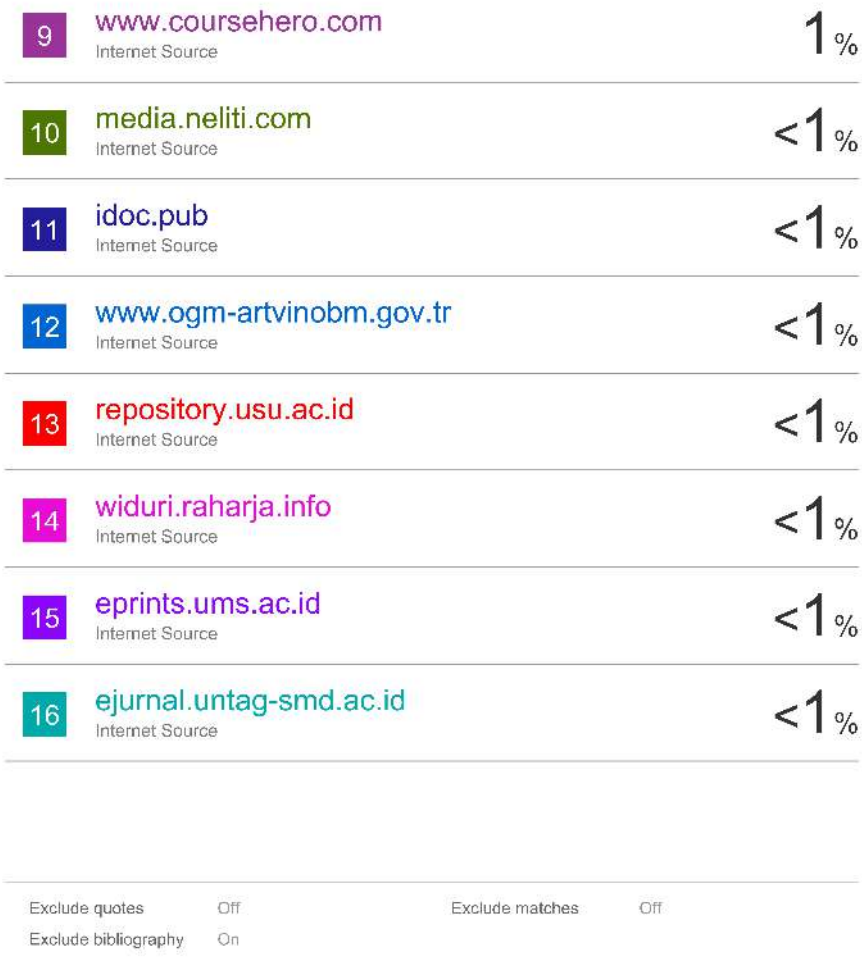
(Sumber: Hasil Perhitungan)



(Sumber: Hasil Perhitungan)

LAMPIRAN

Lampiran 2. Data Bendung Cawak

1. Nama Bendung	: Bendung Cawak
2. Manfaat	: Irigasi
3. Penggunaan lahan sekitar	: Sawah
4. Tahun Konstruksi	: 1991
5. Provinsi	: Jawa Timur
6. Kabupaten/Kota	: Bojonegoro
7. Kecamatan	: Kepohbaru
8. Desa/Kelurahan	: Sidomukti
9. Jarak Ke kantor Desa	: 1 Km
10. Kepemilikan Lahan	: Dinas Pengairan
11. Sungai	: Sub DAS bengawan Solo
12. Koordinat Tubuh Bendung bagian kiri	: X: S07 12.977' Y: E112 05.665'
13. Koordinat Tubuh Bendung bagian kanan	: X: S07 12.937' Y: E112 05.662'
14. Lebar puncak tubuh bendung	: 10 m
15. Panjang keliling tubuh bendung	: 1,70 m
16. Tinggi tubuh bendung	: 1,50 m
17. Kemiringan tubuh embung hulu	: 1 : 1,20
18. Kemiringan tubuh embung hilir	: 1 : 1,10
19. Pengamanan lereng bagian hulu	: Tanah
20. Pengamanan lereng bagian hilir	: Tanah
21. Tipe Intake	: Pintu
22. Lebar Intake	: 1 m
23. Tinggi Intake	: 1,5 m
24. Panjang Intake	: 5 m
25. Tipe jalan Inpeksi	: Aspal
26. Panjang jalan inpeksi	: 50 m
27. Luas DAS	: 17730000 m2
28. Kapasitas Tampungan	: 1350 m3

Lampiran 3. Surat Permohonan Data

UNIVERSITAS 17 AGUSTUS 1945 (UNTAG) SURABAYA
FAKULTAS TEKNIK
Kampus : Jl. Semolowaru No. 45 Surabaya 60118 Telp. +62 31 5931800 (hunting) Fax. +62 31 5927817
- Program Studi Teknik Industri
- Program Studi Teknik Mesin
- Program Studi Teknik Sipil
- Program Studi Teknik Arsitektur
- Program Studi Teknik Elektro
- Program Studi Teknik Informatika
- Program Studi Magister Teknik Sipil

Homepage : ft.untag-sby.ac.id Email : teknik@untag-sby.ac.id

Nomor : **850/K/FT/Akd/IX/2020** **Surabaya, 08 September 2020**
Lampiran : -
Perihal : **Survey Data**

Kepada Yth : **Dinas Pekerjaan Umum Sumber Daya Air Pemkab. Bojonegoro**
Jl. Basuki Racmad No. 4 A. Bojonegoro

Dengan hormat,
Sebagai salah satu persyaratan untuk menyelesaikan studi pada program Strata 1, maka mahasiswa/mahasiswi diwajibkan untuk melakukan **Survey Data** sebagai penerapan teori dan praktek yang diperoleh selama masa studinya.
Sehubungan dengan hal tersebut, maka dengan ini kami mohon Bapak/Ibu berkenan untuk memberikan ijin kepada mahasiswa/mahasiswi sebagai berikut :

No	Nama	NBI	EMAIL	No.HP
1.	Bayu Aji Dwi Saputro	1431600106	bayu.ads69@gmail.com	085708384417

Program Studi Teknik Informatika
Guna melaksanakan **Survey Data** di :

"Dinas Pekerjaan Umum Sumber Daya Air Pemkab. Bojonegoro"

yang akan dimulai pada : **Semester Gasal 2020-2021**
Demikian permohonan kami, atas perkenannya disampaikan terima kasih.

a.n. Dekan
Ka.Tata Usaha,

Totok Mariyono, S.E.

Lampiran 4. Data Curah Hujan

Stasiun Cawak	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	345	204	176	248	220	27	40	37	74	199	62	132
HH	21	11	9	9	11	5	2	4	8	8	5	8
2011	110	152	180	105	149	40	10	0	25	20	214	320
HH	8	10	7	8	8	2	1	0	3	4	13	13
2012	185	220	66	65	60	0	0	0	0	50	180	215
HH	12	9	3	3	3	0	0	0	0	2	10	10
2013	270	168	370	225	60	105	45	0	10	15	182	370
HH	15	8	14	11	5	9	6	0	1	2	12	10
2014	161	254	235	229	19	0	0	0	0	30	86	311
HH	8	12	13	13	2	0	0	0	0	2	8	12
2015	323	297	235	262	59	92	0	0	0	0	214	352
HH	12	15	13	12	5	3	0	0	0	0	9	18
2016	203	333	172	202	198	289	89	55	39	161	375	234
HH	14	14	9	13	12	12	5	3	3	8	12	9
2017	326	232	283	302	113	76	37	0	87	87	176	286
HH	15	7	12	11	6	3	1	0	5	5	10	13
2018	144	215	274	126	49	41	0	0	0	45	154	370
HH	9	14	12	8	4	2	0	0	0	4	6	10
2019	249	192	243	324	243	0	11	0	87	9	119	179
HH	11	9	15	10	15	0	1	0	5	1	6	9

Stasiun Kerjo	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	255	232	230	177	163	108	69	55	168	143	129	203
HH	13	8	10	9	6	5	4	3	8	8	7	12
2011	121	213	273	138	146	23	22	0	36	0	334	350
HH	12	14	15	7	10	1	1	0	2	0	13	13
2012	164	220	110	30	21	0	0	0	0	26	90	261
HH	8	10	5	2	2	0	0	0	0	1	6	17
2013	321	112	224	116	56	35	25	0	23	43	121	227
HH	16	7	14	10	2	5	3	0	1	3	7	9
2014	68	136	232	171	14	0	0	0	0	0	57	292
HH	8	19	12	12	1	0	0	0	0	0	5	12
2015	246	241	235	224	27	86	0	0	0	0	97	299
HH	11	11	13	19	3	2	0	0	0	0	6	15
2016	31	178	42	16	0	62	0	28	9	129	247	89
HH	1	8	5	2	0	1	0	2	1	7	7	5
2017	373	139	239	338	103	108	76	0	79	98	234	270
HH	16	10	10	13	5	4	2	0	5	6	13	16
2018	146	278	186	35	15	33	0	0	0	54	57	227
HH	12	14	11	4	1	4	0	0	0	3	2	9
2019	209	121	170	230	170	0	0	0	87	0	53	98
HH	11	7	12	10	12	0	0	0	5	0	2	5

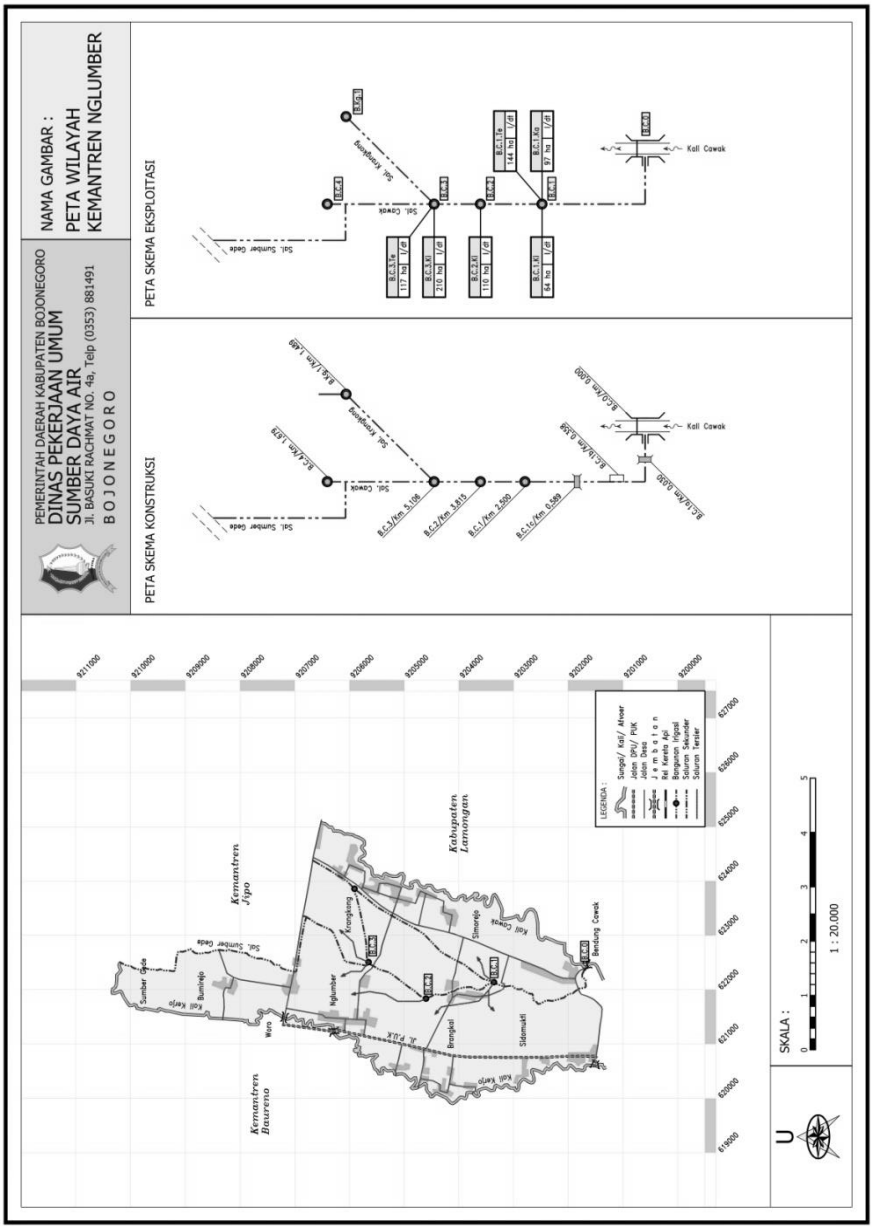
(Sumber : Dinas PUSDA Kabupaten Bojonegoro)

Lampiran 4. Data Curah Hujan (Lanjutan)

Stasiun Simorejo	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	346	189	333	236	494	136	147	71	256	92	220	393
HH	12	13	14	18	12	8	4	4	13	6	9	15
2011	158	214	313	297	363	20	48	0	41	30	280	375
HH	20	11	13	19	9	2	1	0	2	2	19	16
2012	349	342	167	67	16	146	0	0	0	38	249	180
HH	17	14	13	5	3	5	0	0	0	2	14	10
2013	643	146	219	131	110	50	166	0	2	67	194	345
HH	16	9	15	12	6	7	11	0	1	5	12	11
2014	124	222	273	195	90	6	20	20	0	10	92	418
HH	9	15	15	12	9	2	1	1	0	2	7	17
2015	226	427	235	307	56	0	0	0	0	9	26	264
HH	13	18	13	15	5	0	0	0	0	1	3	15
2016	224	404	85	375	73	158	20	42	138	166	263	152
HH	7	14	9	15	8	10	3	4	4	11	13	10
2017	366	78	172	193	44	66	95	0	50	324	239	275
HH	17	10	11	14	5	5	2	0	2	10	12	17
2018	163	182	181	60	0	95	0	0	0	14	110	345
HH	8	11	10	3	0	2	0	0	0	2	5	11
2019	196	134	232	232	232	0	0	0	87	76	172	139
HH	10	8	13	10	13	0	0	0	5	2	6	10

(Sumber : Dinas PUSDA Kabupaten Bojonegoro)

Lampiran 5. Peta Daerah Irigasi



(Sumber : Dinas PUSDA Kabupaten Bojonegoro)

Lampiran 6. Data Klimatologi

2017

No	Jenis Data	Bulan											
		Jan	Feb	Mar	Apr	Mei	Juni	Juli	Agust	Sept	Okt	Nov	Des
1	Temperatur T(C)	23.38	23.36	23.56	23.82	24.24	23.88	23.63	23.69	24.68	25.17	23.96	23.78
2	Kelembapan RH (%)	91.90	94.21	91.28	91.69	82.33	82.48	80.27	75.57	79.50	80.20	86.58	88.83
3	Penyinaran Matahari SS (jam)	2.31	2.24	4.20	5.26	6.45	6.29	6.61	8.40	7.65	6.39	2.69	3.40
4	Kecepatan Angin FF (M/S)	1.55	1.34	1.41	1.40	1.74	1.56	1.50	1.77	1.73	1.63	1.38	1.35
5	Penyinaran Matahari SS (%)	7.46	9.35	15.81	21.17	26.88	23.58	25.78	33.87	30.81	23.19	10.46	10.95
6	Kecepatan Angin FF (km/hari)	133.78	116.19	114.27	120.96	150.50	120.96	125.42	153.29	149.76	136.57	115.20	97.55
7	Kecepatan Angin FF (knots)	3.01	2.61	2.57	2.72	3.39	2.72	2.82	3.45	3.37	3.07	2.59	2.19

2018

No	Jenis Data	Bulan											
		Jan	Feb	Mar	Apr	Mei	Juni	Juli	Agust	Sept	Okt	Nov	Des
1	Temperatur T(C)	23.38	23.23	23.56	23.82	24.24	23.88	23.63	23.69	24.68	25.17	23.96	23.78
2	Kelembapan RH (%)	91.90	92.00	91.28	91.69	82.33	82.48	80.27	75.57	79.50	80.20	86.58	88.83
3	Penyinaran Matahari SS (jam)	2.31	2.60	4.20	5.26	6.45	6.29	6.61	8.40	7.65	6.39	2.69	3.40
4	Kecepatan Angin FF (M/S)	1.55	1.93	1.41	1.40	1.74	1.56	1.50	1.77	1.73	1.63	1.38	1.35
5	Penyinaran Matahari SS (%)	7.46	10.45	15.81	21.17	26.88	23.58	25.78	33.87	30.81	23.19	10.46	10.95
6	Kecepatan Angin FF (km/hari)	133.78	166.63	114.27	120.96	150.50	120.96	125.42	153.29	149.76	136.57	115.20	97.55
7	Kecepatan Angin FF (knot)	3.01	3.75	2.57	2.72	3.39	2.72	2.82	3.45	3.37	3.07	2.59	2.19

2019

No	Jenis Data	Bulan											
		Jan	Feb	Mar	Apr	Mei	Juni	Juli	Agust	Sept	Okt	Nov	Des
1	Temperatur T(C)	23.54	23.35	23.51	24.64	24.69	24.16	23.69	23.44	25.11	26.25	25.80	24.40
2	Kelembapan RH (%)	89.45	90.52	90.74	88.39	84.55	84.68	74.32	71.58	66.52	67.03	76.42	84.71
3	Penyinaran Matahari SS (jam)	3.24	3.99	4.50	7.32	7.72	7.06	8.58	8.18	7.63	8.42	5.80	3.97
4	Kecepatan Angin FF (M/S)	2.52	2.16	1.16	1.10	1.29	1.26	1.29	1.26	1.68	1.39	1.32	1.10
5	Penyinaran Matahari SS (%)	13.49	16.61	18.75	30.51	32.16	29.41	35.74	34.10	31.80	35.07	24.18	16.55
6	Kecepatan Angin FF (km/hari)	217.39	186.74	100.34	94.76	111.48	108.70	111.48	108.70	144.93	119.85	114.27	94.76
7	Kecepatan Angin FF (knots)	4.89	4.20	2.26	2.13	2.51	2.45	2.51	2.45	3.26	2.70	2.57	2.13

(Sumber : Dinas PUSDA Kabupaten Bojonegoro)

Lampiran 7. Rekapitulasi Evapotranspirasi

No	Bulan	Evapotranspirasi		Evaporasi	
		mm/hari	mm/bln	mm/hari	mm/bln
1	Jan	3.040	48.64	3.344	53.509
2	Feb	2.968	47.49	3.265	52.236
3	Mar	2.738	43.80	3.012	48.184
4	Apr	2.484	39.75	2.732	43.720
5	Mei	2.382	38.10	2.620	41.915
6	Jun	2.151	34.41	2.366	37.854
7	Jul	2.337	37.39	2.570	41.124
8	Agu	2.940	47.04	3.234	51.742
9	Sep	3.594	57.51	3.953	63.256
10	Okt	3.726	59.61	4.098	65.570
11	Nov	3.288	52.61	3.617	57.871
12	Des	3.088	49.41	3.397	54.353

(Sumber : Hasil Perhitungan)

Lampiran 8. Persiapan Lahan

Bulan		Eto	EO= 1,1xETo	P	M=EO+P	k=MxT/S				LP=M.ek/(ek-1)mm/hari
						T=30hari		T=45hari		T=45hari
		(mm/hari)	(mm/hari)	(mm/hari)	(mm/hari)	S=250mm (mm/hari)	S=300mm (mm/hari)	S=250mm (mm/hari)	S=300mm (mm/hari)	S=250mm (mm/hari)
Jan	I	3.040	3.344	2.00	5.344	0.641	0.534	0.962	0.802	8.650
	II	3.040	3.344	2.00	5.344	0.641	0.534	0.962	0.802	8.650
Feb	I	2.968	3.265	2.00	5.265	0.632	0.526	0.948	0.790	8.598
	II	2.968	3.265	2.00	5.265	0.632	0.526	0.948	0.790	8.598
Mar	I	2.738	3.012	2.00	5.012	0.601	0.501	0.902	0.752	8.433
	II	2.738	3.012	2.00	5.012	0.601	0.501	0.902	0.752	8.433
Apr	I	2.484	2.732	2.00	4.732	0.568	0.473	0.852	0.710	8.254
	II	2.484	2.732	2.00	4.732	0.568	0.473	0.852	0.710	8.254
Mei	I	2.382	2.620	2.00	4.620	0.554	0.462	0.832	0.693	8.182
	II	2.382	2.620	2.00	4.620	0.554	0.462	0.832	0.693	8.182
Juni	I	2.151	2.366	2.00	4.366	0.524	0.437	0.786	0.655	8.022
	II	2.151	2.366	2.00	4.366	0.524	0.437	0.786	0.655	8.022
Juli	I	2.337	2.570	2.00	4.570	0.548	0.457	0.823	0.686	8.151
	II	2.337	2.570	2.00	4.570	0.548	0.457	0.823	0.686	8.151
Agust	I	2.940	3.234	2.00	5.234	0.628	0.523	0.942	0.785	8.577
	II	2.940	3.234	2.00	5.234	0.628	0.523	0.942	0.785	8.577
Sept	I	3.594	3.953	2.00	5.953	0.714	0.595	1.072	0.893	9.054
	II	3.594	3.953	2.00	5.953	0.714	0.595	1.072	0.893	9.054
Okt	I	3.726	4.098	2.00	6.098	0.732	0.610	1.098	0.915	9.152
	II	3.726	4.098	2.00	6.098	0.732	0.610	1.098	0.915	9.152
Nov	I	3.288	3.617	2.00	5.617	0.674	0.562	1.011	0.843	8.829
	II	3.288	3.617	2.00	5.617	0.674	0.562	1.011	0.843	8.829
Des	I	3.088	3.397	2.00	5.397	0.648	0.540	0.971	0.810	8.684
	II	3.088	3.397	2.00	5.397	0.648	0.540	0.971	0.810	8.684

(Sumber : Hasil Perhitungan)

Lampiran 9. Perencanaan Pola Tanam

Padi-Palawija-Padi

Musim Tanam	Bulan	Periode	Hari	Eo (mm/hari)	Eto (mm/hari)	P (mm/hari)	Re (mm/hari)	WLR (mm/hari)	PADI							
									Koeisien Tanaman				Etc	Total Keb. Air	NFR	DR
									c1	c2	c3	c	(mm/hari)	(mm/hari)	(mm/hari)	(lt/dt/ha)
Padi 2	Ags	1	15	2.732	2.337	2.00	0.63		LP	LP	LP	LP		4.732	4.102	0.309
		2	16	2.732	2.940	2.00	0.63		1.10	LP	LP	LP		4.732	4.102	0.309
	Sep	1	15	2.620	3.594	2.00	0.65		1.10	1.10	LP	LP		4.620	3.970	0.299
		2	15	2.620	3.594	2.00	0.65		1.05	1.10	1.10	1.08	3.894	8.513	7.863	0.592
	Okt	1	15	2.366	3.726	2.00	0.79	3.33	1.05	1.05	1.10	1.07	3.974	11.673	10.883	0.819
		2	16	2.366	3.726	2.00	0.79		0.95	1.05	1.05	1.02	3.788	8.154	7.364	0.554
	Nov	1	15	2.570	3.288	2.00	7.88	3.33		0.95	1.05	1.00	3.288	11.192	3.312	0.249
		2	15	2.570	3.288	2.00	7.88				0.95	0.95	3.124	7.694	-0.186	-0.014
Palawija	Des	1	15	3.234	3.088	2.00	17.49		0.50			0.50	1.544	8.489	-9.001	-0.677
		2	16	3.234	3.088	2.00	17.49		0.59	0.50		0.55	1.683	8.489	-9.001	-0.677
	Jan	1	15	3.953	3.040	2.00	10.74		0.96	0.59	0.50	0.68	2.078	4.078	-6.662	-0.501
		2	16	3.953	3.040	2.00	10.74		1.05	0.96	0.59	0.87	2.635	4.635	-6.105	-0.459
	Feb	1	15	4.098	2.968	2.00	13.27		1.02	1.05	0.96	1.01	2.998	4.998	-8.272	-0.622
		2	13	4.098	2.968	2.00	13.27		0.95	1.02	1.05	1.01	2.988	4.988	-8.282	-0.623
	Mar	1	15	3.617	2.738	2.00	10.09			0.95	1.02	0.99	2.697	4.697	-5.393	-0.406
		2	16	3.617	2.738	2.00	10.09				0.95	0.95	2.601	4.601	-5.489	-0.413
Padi 1	Apr	1	15	3.397	2.484	2.00	9.57		LP	LP	LP	LP		8.818	-0.752	-0.057
		2	15	3.397	2.484	2.00	9.57		1.10	LP	LP	LP		8.818	-0.752	-0.057
	Mei	1	15	3.344	2.382	2.00	4.97		1.10	1.10	LP	LP		8.664	3.694	0.278
		2	16	3.344	2.382	2.00	4.97		1.05	1.10	1.10	1.08	2.580	7.924	2.954	0.222
	Jun	1	15	3.265	2.151	2.00	2.71	3.33	1.05	1.05	1.10	1.07	2.294	10.892	8.182	0.616
		2	15	3.265	2.151	2.00	2.71		0.95	1.05	1.05	1.02	2.187	7.451	4.741	0.357
	Jul	1	15	3.012	2.337	2.00	1.21	3.33		0.95	1.05	1.00	2.337	10.681	9.471	0.713
		2	16	3.012	2.337	2.00	1.21				0.95	0.95	2.220	7.231	6.021	0.453
Kebutuhan Air Maksimum													Palawija		-7.276	-0.547
													Padi 1		4.195	0.316
													Padi 2		5.176	0.389

(Sumber : Hasil Perhitungan)

Padi-Padi-Palawija

Musim Tanam	Bulan	Periode	Hari	Eo (mm/hari)	Eto (mm/hari)	P (mm/hari)	Re (mm/hari)	WLR (mm/hari)	PADI							
									Koeisien Tanaman				Etc	Total Keb. Air	NFR	DR
									c1	c2	c3	c	(mm/hari)	(mm/hari)	(mm/hari)	(lt/dt/ha)
Padi 1	Ags	1	15	3.397	2.337	2.00	0.63		LP	LP	LP	LP		5.397	4.767	0.359
		2	16	3.397	2.940	2.00	0.63		1.10	LP	LP	LP		5.397	4.767	0.359
	Sep	1	15	3.344	3.594	2.00	0.65		1.10	1.10	LP	LP		5.344	4.694	0.353
		2	15	3.344	3.594	2.00	0.65		1.05	1.10	1.10	1.08	3.894	9.238	8.588	0.646
	Okt	1	15	3.265	3.726	2.00	0.79	3.33	1.05	1.05	1.10	1.07	3.974	12.572	11.782	0.886
		2	16	3.265	3.726	2.00	0.79		0.95	1.05	1.05	1.02	3.788	9.052	8.262	0.622
	Nov	1	15	3.012	3.288	2.00	7.88	3.33		0.95	1.05	1.00	3.288	11.633	3.753	0.282
		2	15	3.012	3.288	2.00	7.88				0.95	0.95	3.124	8.135	0.255	0.019
Padi 2	Des	1	15	2.732	3.088	2.00	10.99		LP	LP	LP	LP		4.732	-6.258	-0.471
		2	16	2.732	3.088	2.00	10.99		1.10	LP	LP	LP		4.732	-6.258	-0.471
	Jan	1	15	2.620	3.040	2.00	13.97		1.10	1.10	LP	LP		4.620	-9.350	-0.703
		2	16	2.620	3.040	2.00	13.97		1.05	1.10	1.10	1.08	3.294	7.913	-6.057	-0.456
	Feb	1	15	2.366	2.968	2.00	17.15	3.33	1.05	1.05	1.10	1.07	3.166	10.865	-6.285	-0.473
		2	13	2.366	2.968	2.00	17.15		0.95	1.05	1.05	1.02	3.017	7.383	-9.767	-0.735
	Mar	1	15	2.570	2.738	2.00	7.48	3.33		0.95	1.05	1.00	2.738	10.641	3.161	0.238
		2	16	2.570	2.738	2.00	7.48				0.95	0.95	2.601	7.171	-0.309	-0.023
Palawija	Apr	1	15	3.234	2.484	2.00	4.17		0.50			0.50	1.242	8.489	4.319	0.325
		2	15	3.234	2.484	2.00	4.17		0.59	0.50		0.55	1.354	8.489	4.319	0.325
	Mei	1	15	3.953	2.382	2.00	3.20		0.96	0.59	0.50	0.68	1.627	3.627	0.427	0.032
		2	16	3.953	2.382	2.00	3.20		1.05	0.96	0.59	0.87	2.064	4.064	0.864	0.065
	Jun	1	15	4.098	2.151	2.00	0.72		1.02	1.05	0.96	1.01	2.172	4.172	3.452	0.260
		2	15	4.098	2.151	2.00	0.72		0.95	1.02	1.05	1.01	2.165	4.165	3.445	0.259
	Jul	1	15	3.617	2.337	2.00	0.23			0.95	1.02	0.99	2.302	4.302	4.072	0.306
		2	16	3.617	2.337	2.00	0.23				0.95	0.95	2.220	4.220	3.990	0.300
Kebutuhan Air Maksimum													Palawija		3.111	0.234
													Padi 1		5.859	0.441
													Padi 2		-5.140	-0.387

(Sumber : Hasil Perhitungan)

Lampiran 10. Perhitungan Debit Andalan

Uraian			Unit	Jan	Feb	Mar
1	Curah Hujan (R)		mm	118	204	247
2	Hari Hujan (n)			8	15	13
Evapotranspirasi Terbatas						
3	Evapotranspirasi (Eto)		mm	94.86	87.38	101.38
4	Lahan Terbuka (m)		%	30.00	30.00	30.00
5	dE/Eto = (m/20)*(18-n)			0.15	0.05	0.08
6	dE	(3)*(5)	mm	14.23	3.93	7.60
7	Et1 = Eto-De	(3)-(6)	mm	80.63	83.45	93.78
Water Balance						
8	S = R-Et1	(1)-(7)	mm	37.04	120.55	152.89
9	*Run Off Storm*	10% * (1)	mm	11.77	20.40	24.67
10	*Soil Storage (IS)*	(8)-(9)	mm	25.27	100.15	128.22
11	*Soil Masture = IS+SMC*	SMC=10	mmHg	35.27	110.15	138.22
12	*Water Surplus*	(8)-(10)	mm	11.77	20.40	24.67
Run Off and Water Storage						
13	Infitrasi(I), i=0.4	(12)*i	mm	4.71	8.16	9.87
14	0.5*I*(1+k), k=0.8	0.5*(13)*1.8	mm	4.24	7.34	8.88
15	k*V(n-1)		mm	160.00	131.39	110.99
16	*Storage Volume (Vn)*	(14)+(15)	mm	164.24	138.73	119.87
17	dVn=(k*V(n-1))-Vn	(15)-(16)	mm	-4.24	-7.34	-8.88
18	*Base Flow*	(13)-(17)	mm	8.94	15.50	18.75
19	*Direct Run Off*	(12)-(13)	mm	7.06	12.24	14.80
20	*Run Off*	(18)+(19)	mm/bln	16.00	27.74	33.55
21	Debit (x1000)	(20)*C*A	m3/bln	62420.00	108218.25	130852.13
22	Debit		m3/dtk	0.0233	0.0447	0.0489
23	Jumlah Hari			31	28	31

Uraian			Unit	Apr	Mei	Juni
1	Curah Hujan (R)		mm	198	41	2
2	Hari Hujan (n)			12	4	1
Evapotranspirasi Terbatas						
3	Evapotranspirasi (Eto)		mm	84.97	80.46	65.82
4	Lahan Terbuka (m)		%	30.00	30.00	30.00
5	dE/Eto = (m/20)*(18-n)			0.09	0.21	0.26
6	dE	(3)*(5)	mm	7.65	16.90	16.78
7	Et1 = Eto-De	(3)-(6)	mm	77.32	63.56	49.03
Water Balance						
8	S = R-Et1	(1)-(7)	mm	121.01	-22.56	-47.03
9	*Run Off Storm*	10% * (1)	mm	19.83	4.10	0.20
10	*Soil Storage (IS)*	(8)-(9)	mm	101.18	-26.66	-47.23
11	*Soil Masture = IS+SMC*	SMC=10	mmHg	111.18	-16.66	-37.23
12	*Water Surplus*	(8)-(10)	mm	19.83	4.10	0.20
Run Off and Water Storage						
13	Infitrasi(I), i=0.4	(12)*i	mm	7.93	1.64	0.08
14	0.5*I*(1+k), k=0.8	0.5*(13)*1.8	mm	7.14	1.48	0.07
15	k*V(n-1)		mm	95.89	82.43	67.12
16	*Storage Volume (Vn)*	(14)+(15)	mm	103.03	83.90	67.19
17	dVn=(k*V(n-1))-Vn	(15)-(16)	mm	-7.14	-1.48	-0.07
18	*Base Flow*	(13)-(17)	mm	15.07	3.12	0.15
19	*Direct Run Off*	(12)-(13)	mm	11.90	2.46	0.12
20	*Run Off*	(18)+(19)	mm/bln	26.97	5.58	0.27
21	Debit (x1000)	(20)*C*A	m3/bln	105212.18	21749.75	1060.96
22	Debit		m3/dtk	0.0406	0.0081	0.0004
23	Jumlah Hari			30	31	30

(Sumber : Hasil Perhitungan)

Uraian			Unit	Juli	Ags	Sep
1	Curah Hujan (R)		mm	7	7	0
2	Hari Hujan (n)			0	0	0
Evapotranspirasi Terbatas						
3	Evapotranspirasi (Eto)		mm	75.72	87.33	106.07
4	Lahan Terbuka (m)		%	30.00	30.00	30.00
5	dE/Eto = (m/20)*(18-n)			0.27	0.27	0.27
6	dE	(3)*(5)	mm	20.44	23.14	28.64
7	Et1 = Eto-De	(3)-(6)	mm	55.27	64.18	77.43
Water Balance						
8	S = R-Et1	(1)-(7)	mm	-48.61	-57.52	-77.43
9	*Run Off Storm*	10% * (1)	mm	0.67	0.67	0.00
10	*Soil Storage (IS)*	(8)-(9)	mm	-49.27	-58.18	-77.43
11	*Soil Masture = IS+SMC*	SMC=10	mmHg	-39.27	-48.18	-67.43
12	*Water Surplus*	(8)-(10)	mm	0.67	0.67	0.00
Run Off and Water Storage						
13	Infitrasi(I), i=0.4	(12)*i	mm	0.27	0.27	0.00
14	0.5*I*(1+k), k=0.8	0.5*(13)*1.8	mm	0.24	0.24	0.00
15	k*V(n-1)		mm	53.76	43.20	34.75
16	*Storage Volume (Vn)*	(14)+(15)	mm	54.00	43.44	34.75
17	dVn=(k*V(n-1))-Vn	(15)-(16)	mm	-0.24	-0.24	0.00
18	*Base Flow*	(13)-(17)	mm	0.51	0.51	0.00
19	*Direct Run Off*	(12)-(13)	mm	0.40	0.40	0.00
20	*Run Off*	(18)+(19)	mm/bln	0.91	0.91	0.00
21	Debit (x1000)	(20)*C*A	m3/bln	3536.54	3536.54	0.00
22	Debit		m3/dtk	0.00132	0.00132	0.00000
23	Jumlah Hari			31	31	30

Uraian			Unit	Okt	Nov	Des
1	Curah Hujan (R)		mm	13	78	340
2	Hari Hujan (n)			1	7	14
Evapotranspirasi Terbatas						
3	Evapotranspirasi (Eto)		mm	113.01	97.75	101.46
4	Lahan Terbuka (m)		%	30.00	30.00	30.00
5	dE/Eto = (m/20)*(18-n)			0.26	0.17	0.06
6	dE	(3)*(5)	mm	28.82	16.13	6.09
7	Et1 = Eto-De	(3)-(6)	mm	84.19	81.62	95.38
Water Balance						
8	S = R-Et1	(1)-(7)	mm	-70.86	-3.28	244.96
9	*Run Off Storm*	10% * (1)	mm	1.33	7.83	34.03
10	*Soil Storage (IS)*	(8)-(9)	mm	-72.19	-11.12	210.92
11	*Soil Masture = IS+SMC*	SMC=10	mmHg	-62.19	-1.12	220.92
12	*Water Surplus*	(8)-(10)	mm	1.33	7.83	34.03
Run Off and Water Storage						
13	Infitrasi(I), i=0.4	(12)*i	mm	0.53	3.13	13.61
14	0.5*I*(1+k), k=0.8	0.5*(13)*1.8	mm	0.48	2.82	12.25
15	k*V(n-1)		mm	27.80	22.62	20.35
16	*Storage Volume (Vn)*	(14)+(15)	mm	28.28	25.44	32.61
17	dVn=(k*V(n-1))-Vn	(15)-(16)	mm	-0.48	-2.82	-12.25
18	*Base Flow*	(13)-(17)	mm	1.01	5.95	25.87
19	*Direct Run Off*	(12)-(13)	mm	0.80	4.70	20.42
20	*Run Off*	(18)+(19)	mm/bln	1.81	10.65	46.29
21	Debit (x1000)	(20)*C*A	m3/bln	7073.09	41554.39	180540.57
22	Debit		m3/dtk	0.0026	0.0160	0.0674
23	Jumlah Hari			31	30	31

(Sumber : Hasil Perhitungan)

Lampiran 11. Rekapitulasi perhitungan debit andalan tahun 2010 - 2019

Bulan	Debit (m3/dtk)									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Jan	0.625	0.257	0.461	0.815	0.233	0.525	0.302	0.703	2.541	0.432
Feb	0.457	0.423	0.572	0.301	0.447	0.705	0.669	0.317	0.493	0.327
Mar	0.488	0.506	0.226	0.537	0.489	0.465	0.197	0.458	0.423	0.426
Apr	0.451	0.368	0.111	0.322	0.406	0.541	0.405	0.568	0.151	0.536
Mei	0.579	0.434	0.064	0.149	0.081	0.094	0.179	0.172	0.042	0.426
Jun	0.185	0.057	0.100	0.130	0.004	0.121	0.347	0.171	0.115	0.000
Jul	0.169	0.053	0.000	0.156	0.013	0.000	0.072	0.137	0.000	0.007
Aug	0.108	0.000	0.000	0.000	0.013	0.000	0.083	0.000	0.000	0.000
Sep	0.340	0.070	0.000	0.024	0.000	0.000	0.127	0.147	0.000	0.178
Okt	0.287	0.033	0.075	0.083	0.026	0.006	0.301	0.336	0.075	0.056
Nov	0.280	0.565	0.354	0.339	0.160	0.230	0.604	0.443	0.219	0.235
Des	0.481	0.690	0.433	0.622	0.674	0.604	0.314	0.549	0.622	0.275
Rerata	0.371	0.288	0.200	0.290	0.212	0.274	0.300	0.333	0.390	0.241
Maxs	0.625	0.690	0.572	0.815	0.674	0.705	0.669	0.703	2.541	0.536

No	Tahun	Debit Rerata	Debit Urut	Tahun Urut	No.Urut	P = m/(n+1)
1	2010	0.3707	0.3901	2018	1	0.09
2	2011	0.2879	0.3707	2010	2	0.18
3	2012	0.1996	0.3334	2017	3	0.27
4	2013	0.2897	0.2999	2016	4	0.36
5	2014	0.2123	0.2897	2013	5	0.45
6	2015	0.2743	0.2879	2011	6	0.55
Q Andalan 50 %						
7	2016	0.2999	0.2743	2015	7	0.64
8	2017	0.3334	0.2414	2019	8	0.73
9	2018	0.3901	**0.2123**	**2014**	9	0.82
Q Andalan 80 %						
10	2019	0.2414	0.1996	2012	10	0.91

(Sumber : Hasil Perhitungan)

Lampiran 12. Foto Lokasi

(Sumber : Hasil Survey)

(Sumber : Hasil Survey)

(Sumber : Hasil Survey)

(Sumber : Hasil Survey)