E-ISSN: 2808-0947
Dearsip, Vol. 06 No. 01 2026

Irrigation Canal Planning in the Irrigation Area of Pandankrajan Village, Kemlagi District, Mojokerto Regency

Handy Surya Syahputra* (1432200038@surel.untag-sby.ac.id)[1]
Faradlillah Saves (farasaves@untag-sby.ac.id)[2]

[1,2] Civil Engineering Study Program, Faculty of Engineering, Universitas 17 Agustus 1945 Surabaya

ABSTRACT

Pandankrajan Village, Kemlagi District, Mojokerto Regency is an agricultural area that depends on irrigation systems to support land productivity. However, uneven water distribution and the condition of several channels that are still earth canals cause suboptimal water supply to some agricultural fields. This study aims to determine irrigation water requirements, evaluate the capacity of existing channels, and redesign channel dimensions if the existing capacity is insufficient. The methods used include hydrological and hydraulic analyses. Average rainfall was calculated using the Arithmetic Mean method and evapotranspiration using the Penman method, while hydraulic analysis employed the Strickler method to determine flow velocity. The results show that the maximum irrigation water requirement is 0.90 l/s/ha for rice and 0.94 l/s/ha for secondary crops. Channel A is still capable of accommodating the planned discharge, while Channel B requires redesign using a rectangular concrete section with a width of 0.60 m, water depth of 0.26 m, and freeboard height of 0.40 m.

Keywords: Irrigation, Irrigation Water Requirement, Channel Capacity, Channel Design

INTRODUCTION

Efforts to increase food production can be achieved by optimizing the use of water resources through effective and efficient water allocation management. One of the practical applications of this approach is in the agricultural sector, particularly to support irrigation needs (Sunjani & Hudhiyantoro, 2019). Irrigation refers to the practice of supplying and regulating water by utilizing constructed structures and artificial canal networks to enhance agricultural productivity. The term "irrigation" itself is derived from the Dutch word *irrigate* and the English term *irrigation*. According to Abdullah Angoedi (1984), in his historical study of irrigation in Indonesia based on Dutch government reports, irrigation in a technical sense is defined as the process of conveying water through distribution channels to agricultural land. After being used optimally, the water is then drained into disposal channels and eventually returned to the river system (Hendrawan & Mayasari, 2021).

To this day, the agricultural sector continues to play a vital role in supporting the national economy, with nearly half of the workforce relying on it for their livelihoods (Rosyid Setiawan, 2023). Mojokerto Regency, as one of the agrarian regions in East Java, holds a strategic position in contributing to regional food supply (BPS Kabupaten Mojokerto, 2023). This condition is also reflected in Pandankrajan Village, where most residents are engaged in agriculture, supported by irrigation water sourced from Pandan Reservoir and distributed through a surface irrigation system that relies on gravity flow.

However, the existing irrigation system has not been able to supply water to all agricultural fields, particularly during the dry season. As a result, some farmers are compelled to rely on pumps or groundwater wells to meet their water needs. In addition, the predominance of earthen canals leads to significant water losses due to seepage, as well as structural degradation caused by erosion. These conditions may ultimately reduce both the quality and the extent of cultivable agricultural land.

To address these issues, a technical planning approach based on established irrigation design standards is required. This includes analyzing water demand, calculating the design discharge, and determining channel dimensions in accordance with the KP-01, KP-03, and KP-05 guidelines. Proper planning is expected to improve the efficiency and stability of the irrigation network, ensuring a more equitable distribution of water, enhancing agricultural productivity, and supporting long-term food security sustainability (Roostrianawaty & Mahmudah, 2023).

RESEARCH METHODOLOGY

The overall research workflow is presented in the form of a flowchart, as illustrated in Figure 1.

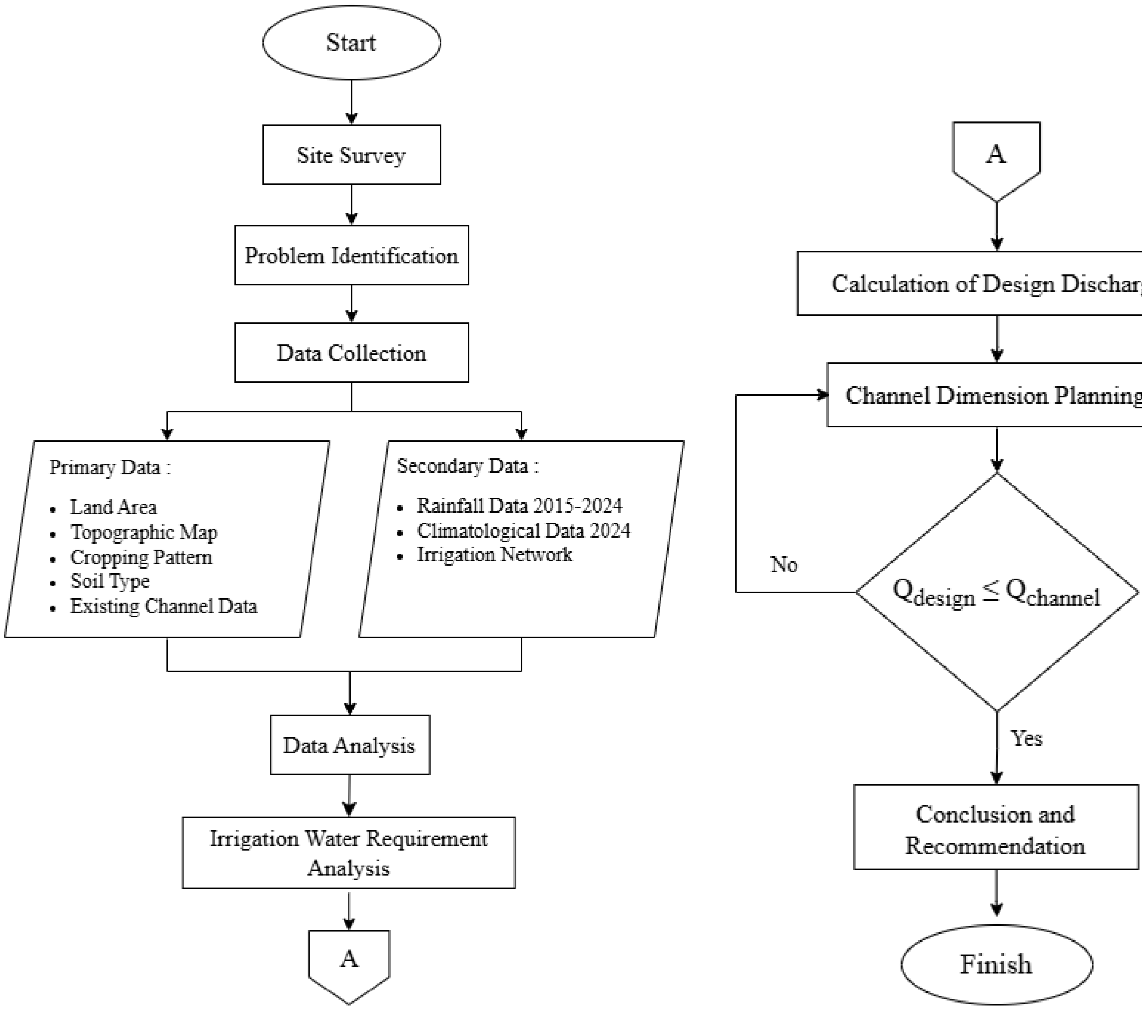

Figure 1. Research Flowchart

2.1. Research Location

The study began with a field survey to assess the existing condition of the irrigation channels and to identify the issues present at the research site. The study area covers approximately 70.5 hectares and is located to the south of Pandan Reservoir, in Pandankrajan Village, Mojokerto Regency.

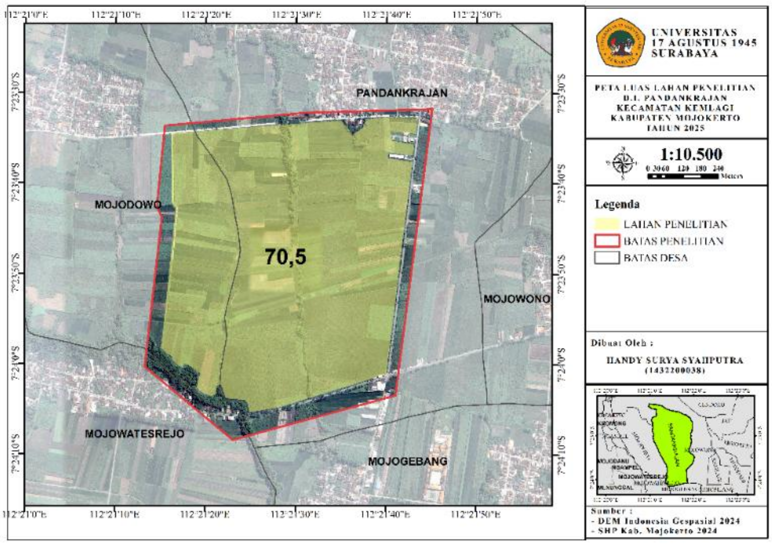

Figure 2. Research Location

2.2. Data Collection and Analysis

The data used in this study consist of primary data obtained through direct field observations and secondary data, including rainfall and climatological records. The rainfall data were collected from the two meteorological stations closest to the research area.

Table 1. Annual Rainfall Data of Gedeg Station

DATA CURAH HUJAN TAHUNAN										
Nama Stasiun	:	Gedeg			Wilayah Sungai		:	Brantas		
Kode Stasiun	:	95A			Kecamatan		:	Gedeg		
Koordinat	:	-7.456424 LS, 112.392894 BT			Kabupaten		:	Mojokerto		
Elevasi	:	167 mdpl			Pengelola		:	UPT Surabaya		
Tahun Pengamatan	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Januari	260	346	292	198	334	356	488	416,0	246	288
Februari	244	561	426	500	229	487	259	315,5	379	476
Maret	373	229	413	410	378	356	296	358,5	320	319
April	407	129	443	235	268	289	113	218,0	221	191
Mei	102	217	45	0	0	209	53	138,0	23	21
Juni	0	192	33	12	0	8	143	68,5	20	72
Juli	1	110	24	9	3	3	1	35,5	21	23
Agustus	0	33	0	0	0	0	12	3,0	0	0
September	0	82	101	62	62	0	189	8,5	0	43
Oktober	0	311	24	0	0	126	189	272,5	0	14
November	92	92	252	66	44	181	166	292,5	9	43
Desember	149	312	247	332	209	326	202	88,0	227	657

Table 2. Annual Rainfall Data of Mernung Station

DATA CURAH HUJAN TAHUNAN										
Nama Stasiun	:	Mernung			Wilayah Sungai		:	Brantas		
Kode Stasiun	:	-			Kecamatan		:	Ngusikan		
Koordinat	:	-7.426042 LS, 112.327142 BT			Kabupaten		:	Jombang		
Elevasi	:	60 mdpl			Pengelola		:	UPT Surabaya		
Tahun Pengamatan	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Januari	298	366	272	0	317	386	267	497,0	206	296
Februari	255	420	468	0	286	371	271	98,0	338	428
Maret	229	363	261	211	376	312	288	669,0	270	227
April	329	155	308	194	292	268	0	191,0	181	251
Mei	168	169	80	0	184	180	82	137,0	24	7
Juni	0	133	23	39	0	50	138	70,0	2	38
Juli	0	92	0	17	0	0	5	32,0	5	2
Agustus	0	0	0	0	0	0	47	14,0	0	0
September	0	100	0	0	0	0	63	24,0	0	0
Oktober	0	347	0	0	0	101	107	380,0	0	0
November	33	33	0	21	0	161	174	416,0	75	101
Desember	293	271	0	335	356	382	289	198,0	347	397

Subsequently, data analysis was carried out, including hydrological analysis to determine average rainfall using the Arithmetic Mean method, effective rainfall, and evapotranspiration estimated by the Penman method. The results of the hydrological analysis were then used to calculate irrigation water requirements, including land preparation needs and net field water requirements (NFR).

Furthermore, hydraulic analysis was conducted to evaluate the capacity of the existing channels and flow velocity using the Strickler method. Based on these results, the design discharge was determined as the basis for channel dimension planning. In the final stage, a comparison was made between the existing channel capacity and the design discharge to assess whether channel improvement or redesign is necessary.

ANALYSIS AND DISCUSSION

3.1. Average Rainfall Analysis

The analysis of average rainfall is carried out using the Arithmetic Mean Method. This method involves calculating the average value of rainfall data obtained from stations located within and around the study area, using the following equation (Sosrodarsono & Takeda, 2003).

$$\bar{R} = \frac{1}{n}(R_1 + R_2 + \cdots + R_n)$$

Description:

R = Average rainfall (mm)

R1,R2,..,Rn = Rainfall at each observation (mm)

n = Number of observation point

Table 3. Results of Average Rainfall Analysis

Tahun Pengamatan	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Januari	279	356	282	99	326	371	378	457	226	292
Februari	250	490	447	250	258	429	265	207	359	452
Maret	301	296	337	311	377	334	292	514	295	273
April	368	142	376	214	280	279	56	205	201	221
Mei	135	193	62	0	92	194	68	138	23	14
Juni	0	163	28	25	0	29	140	69	11	55
Juli	1	101	12	13	1	1	3	34	13	12
Agustus	0	16	0	0	0	0	29	9	0	0
September	0	91	50	31	31	0	126	16	0	22
Oktober	0	329	12	0	0	113	148	326	0	7
November	63	63	126	43	22	171	170	354	42	72
Desember	221	291	124	334	283	354	245	143	287	527
TOTAL	1616	2531	1856	1319	1669	2275	1920	2470	1456	1946

Based on Table 3, the rainfall data used represent the average values obtained from the two rainfall stations located closest to the study area (Tables 1 and 2). These values are considered to adequately reflect the rainfall conditions within the study region.

3.2. Dependable Rainfall Analysis

The determination of dependable rainfall was carried out by arranging the average monthly rainfall data in the study area in descending order, from the highest to the lowest values. Subsequently, the probability of occurrence was calculated to assess its reliability using the following equation (Rika Oktaviani & Hermansyah, 2024).

$$P = \frac{m}{n+1} \times 100\%$$

Description:
P = Probability (%)
m = Rank number of the data, arranged from highest to lowest.
n = Number of years of rainfall data

Once the probability values are obtained, if the required reliability levels (such as 50% and 80%) are not directly available from the data, interpolation is performed to estimate the corresponding rainfall values.

Table 4. Probability Analysis Results

No. Urut	P (%)	Tahun Pengamatan	Jan	Feb	Mar	Apr	Mei	Jun	Jul	Agu	Sep	Okt	Nov	Des	TOTAL
1	9%	2016	356	490	296	142	193	163	101	16	91	329	63	291	2531
2	18%	2022	457	207	514	205	138	69	34	9	16	326	354	143	2470
3	27%	2020	371	429	334	279	194	29	1	0	0	113	171	354	2275
4	36%	2024	292	452	273	221	14	55	12	0	22	7	72	527	1946
5	45%	2021	378	265	292	56	68	140	3	29	126	148	170	245	1920
6	55%	2017	282	447	337	376	62	28	12	0	50	12	126	124	1856
7	64%	2019	326	258	377	280	92	0	1	0	31	0	22	283	1669
8	73%	2015	279	250	301	368	135	0	1	0	0	0	63	221	1616
9	82%	2023	226	359	295	201	23	11	13	0	0	0	42	287	1456
10	91%	2018	99	250	311	214	0	25	13	0	31	0	43	334	1319

Table 5. Dependable Rainfall Analysis Results

P (%)	Tahun Pengamatan	Jan	Feb	Mar	Apr	Mei	Jun	Jul	Agu	Sep	Okt	Nov	Des
9%	2016	356	490	296	142	193	163	101	16	91	329	63	291
18%	2022	457	207	514	205	138	69	34	9	16	326	354	143
27%	2020	371	429	334	279	194	29	1	0	0	113	171	354
36%	2024	292	452	273	221	14	55	12	0	22	7	72	527
45%	2021	378	265	292	56	68	140	3	29	126	148	170	245
55%	2017	282	447	337	376	62	28	12	0	50	12	126	124
64%	2019	326	258	377	280	92	0	1	0	31	0	22	283
73%	2015	279	250	301	368	135	0	1	0	0	0	63	221
82%	2023	226	359	295	201	23	11	13	0	0	0	42	287
91%	2018	99	250	311	214	0	25	13	0	31	0	43	334
	50%	330	356	315	216	65	84	8	15	88	80	148	184
	80%	237	337	296	234	46	9	11	0	0	0	46	274

3.3. Effective Rainfall Analysis

Effective rainfall is the portion of total rainfall that occurs over agricultural land during the crop growth period and can be utilized to meet crop water requirements. In this study, the calculation is based on a 15-day period. Effective rainfall can be determined using the following equations (KP-01, 2013).

$$\text{Re Paddy} = \frac{70\% \times R_{80}}{Number\ of\ days\ in\ period}$$

$$\text{Re Secondary Crops} = \frac{50\% \times R_{50}}{Number\ of\ days\ in\ period}$$

Description:
Re = Effective rainfall (mm)
R_{50} = Dependable rainfall at 50% probability
R_{80} = Dependable rainfall at 80% probability

Table 6. Effective Rainfall Analysis Results

Bulan		R80	R50	Re Padi	Re Palawija
Jan	I	67,7	166,6	3,2	5,6
	II	168,9	163,2	7,9	5,4
Feb	I	177,5	152,6	8,3	5,1
	II	159,2	203,5	7,4	6,8
Maret	I	106,3	168,9	5,0	5,6
	II	189,9	145,7	8,9	4,9
Apr	I	160,9	118,8	7,5	4,0
	II	73,5	97,05	3,4	3,2
Mei	I	43	10,63	2,0	0,4
	II	2,6	54,25	0,1	1,8
Ju	I	0	23,88	0,0	0,8
	II	8,8	60,25	0,4	2,0
Jul	I	10,4	4,2	0,5	0,1
	II	0,1	3,4	0,0	0,1
Ags	I	0	6,5	0,0	0,2
	II	0	8,125	0,0	0,3
Sep	I	0	54,5	0,0	1,8
	II	0	33,65	0,0	1,1
Okt	I	0	43,13	0,0	1,4
	II	0	36,75	0,0	1,2
Nov	I	13,1	56,58	0,6	1,9
	II	32,8	91,4	1,5	3,0
Des	I	193,9	118,1	9,0	3,9
	II	79,67	66,4	3,7	2,2

3.4. Evapotranspiration Analysis

Evapotranspiration (ETo) is the process of water loss from the earth's surface to the atmosphere, encompassing evaporation from the soil and transpiration from plants, which occurs through the transfer of latent heat per unit area. The results of this evapotranspiration calculation are subsequently used as a basis for determining crop water requirements. In this study, ETo was estimated using the Modified Penman Method, expressed by the following equation (Baskoro et al., 2024;Hudhiyantoro, 2019).

$$ETo^* = W\ (0{,}75\ Rs - Rn1) + (1 - W) f(u)(\varepsilon y - yd)$$
$$ETo \ = C\ x\ ETo^*$$

Description:

ETo* = Uncorrected potential evapotranspiration (mm/day)
ETo = Potential evapotranspiration (mm/day)
C = Penman correction factor
W = Weighting factor influenced by air temperature (T) and elevation.
Rs = Shortwave radiation (mm/day)
Ra = Solar radiation reaching the atmosphere
Rn1 = Net radiation (mm/day)
f(T) = Temperature function
yd = Mean saturated vapor pressure (mbar)
f(yd) = Saturated vapor pressure function (mbar)
f(n/N) = Actual-to-maximum sunshine duration ratio function
f(u) = Wind speed function (m/dt)
εy = Mean vapor pressure (mbar)
n/N = Sunshine duration ratio (%)

Table 7. Evapotranspiration Analysis Results

Keterangan	Jan	Feb	Mar	Apr	Mei	Jun	Jul	Agu	Sep	Okt	Nov	Des
w	0,77	0,77	0,77	0,78	0,78	0,78	0,77	0,78	0,78	0,77	0,77	0,78
εy	36,50	36,09	37,37	38,25	38,70	37,81	37,37	37,81	39,14	37,37	36,94	37,81
f(t)	16,18	16,14	16,26	16,34	16,38	16,30	16,26	16,30	16,42	16,26	16,22	16,30
yd	30,66	30,32	31,65	31,17	32,43	30,82	29,07	29,15	29,63	30,87	31,62	31,31
f(yd)	0,10	0,10	0,09	0,09	0,09	0,10	0,10	0,10	0,10	0,10	0,09	0,09
Ra	15,65	15,95	15,85	15,00	13,55	13,00	13,30	14,15	15,20	15,65	15,55	15,55
Rs	4,31	4,36	4,40	4,22	3,76	3,72	3,89	4,16	4,39	4,34	4,21	4,23
f(n/N)	0,14	0,14	0,15	0,15	0,15	0,16	0,17	0,17	0,16	0,15	0,13	0,14
f(U)	1,48	1,32	1,16	0,99	1,13	1,06	1,32	1,41	1,30	1,18	1,04	1,37
Rn1	0,22	0,22	0,22	0,23	0,21	0,25	0,28	0,29	0,27	0,23	0,20	0,21
C	1,1	1,1	1,1	0,9	0,9	0,9	0,90	1,00	1,10	1,10	1,10	1,10
ETo*	4,32	4,11	3,88	3,84	3,60	3,64	4,52	4,95	5,06	4,08	3,54	4,30
ETo	4,75	4,53	4,27	3,46	3,24	3,28	4,07	4,95	5,57	4,49	3,90	4,73

3.5. Analysis of Net Field Water Requirement (NFR)

The values obtained from this calculation represent the actual amount of water required by crops to achieve optimal growth in the field. Furthermore, the calculated NFR is used as a basis for determining the design discharge of the irrigation channel, ensuring that the planned channel capacity can effectively meet water demands across the paddy fields. The crop water requirement in rice fields can be expressed using the following equation (Utama et al., 2022).

$$NFR = ETc + P + WLR - Re$$

Description:
NFR = Net Field Requirement (mm/day)
ETc = Crop water requirement (mm/day)
WLR = Water layer replacement (mm/day)
P = Percolation (mm/day)

The design discharge is calculated to meet the net field water requirement, which is then used to determine the channel discharge using the following equation (Utama et al., 2022).

$$DR = \frac{NFR \times 0{,}1157}{E}$$

Description:
DR = Intake water requirement (l/s/ha)
NFR = Net field water requirement (mm/day)
E = Irrigation efficiency (%)
0,1157 = Conversion factor from mm/day to l/s/ha

Table 8. Net Field Water Requirement Results

Bulan		Januari		Februari		Maret		April		Mei		Juni	
		I	II	I	II	I	II	I	II	I	II	I	II
NFR	lt/dt/ha	0,90	-0,02	0,50	0,60	-0,09	-0,33	0,06	0,54	0,81	0,73	1,36	1,31
Ef	%	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65
DR	lt/dt/ha	1,39	-0,03	0,78	0,93	-0,13	-0,51	0,09	0,84	1,24	1,12	2,10	2,03
Bulan		Juli		Agustus		September		Oktober		November		Desember	
		I	II	I	II	I	II	I	II	I	II	I	II
NFR	lt/dt/ha	0,31	0,46	0,68	0,79	0,94	0,94	1,46	1,46	0,40	0,48	0,06	0,70
Ef	%	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65
DR	lt/dt/ha	0,48	0,71	1,05	1,21	1,45	1,45	2,25	2,25	0,62	0,75	0,10	1,08

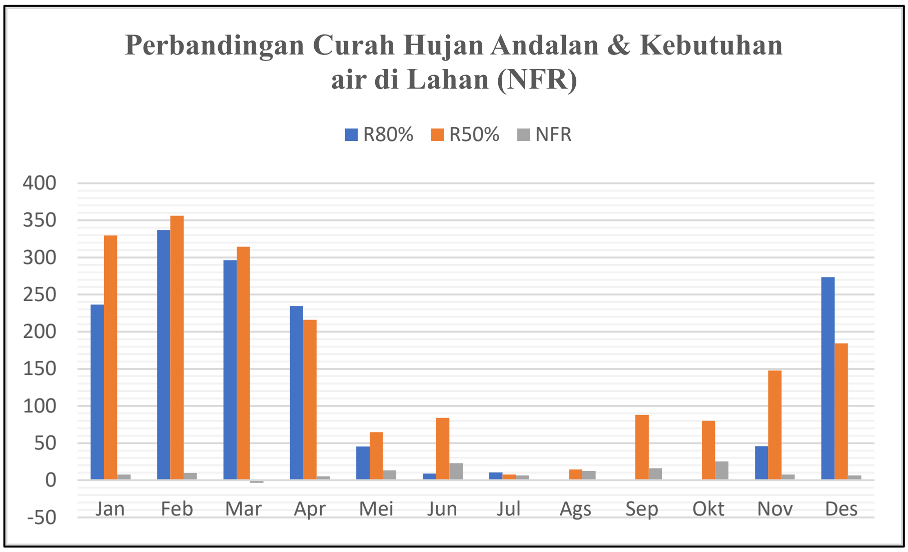

Figure 3. Comparison of Dependable Rainfall and Field Water Requirements (NFR)

3.6. Design Discharge Analysis

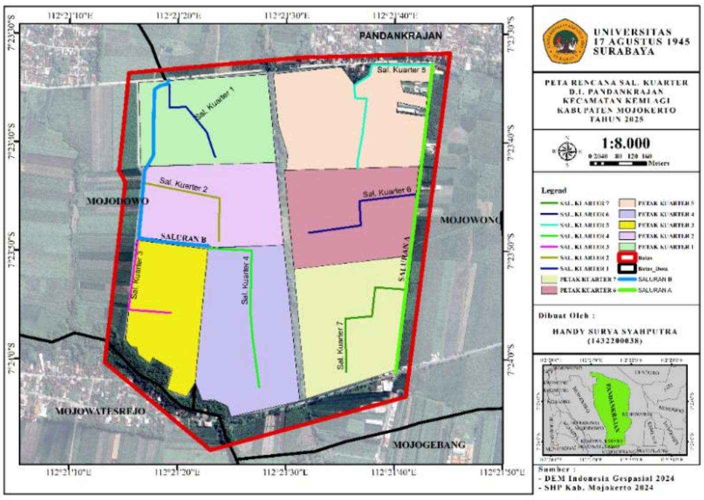

Figure 4. Layout Plan of Quarter Irrigation Channels

In this study, the addition of a quaternary canal is proposed as a solution to the issues identified at the study site, as illustrated in Figure 3. The design discharge of the channel can be calculated using the appropriate equation as the basis for the analysis (Utama et al., 2022).

$$Q_{renc} = \frac{DR \times A}{E}$$

Description:

Q_{plan} = Design discharge of the channel (m^3/s)
A = Irrigated area (ha)
E = Irrigation efficiency (%)
DR = Intake water requirement (l/s/ha)

Table 9. Results of Quarter Channel Design Discharge

Saluran	Area Layanan (ha)	DR (lt/dt/ha)	Efisiensi (%)	Qrenc (m^3/dt)
Kuarter 1	9,11	1,39	0,8	0,016
Kuarter 2	8,81	1,39	0,8	0,015
Kuarter 3	8,11	1,39	0,8	0,014
Kuarter 4	11,67	1,39	0,8	0,020
Kuarter 5	11,21	1,39	0,8	0,019
Kuarter 6	9,78	1,39	0,8	0,017
Kuarter 7	9,91	1,39	0,8	0,017

3.7. Analysis of Existing Channel Capacity

At this stage of analysis, two tertiary channels were identified in the study area, namely Channel A and Channel B.

Table 10. Results of Existing Channel Capacity Analysis

Keterangan	Satuan	Saluran A	Saluran B
Lebar Bawah (B)	(m)	1,2	0,5
Lebar Atas (T)	(m)	2,5	0,85
Kedalaman (H)	(m)	1,3	0,35
Kecepatan Aliran (V)	(m/s)	0,15	0,22
Panjang (L)	(m)	878	676
Beda Tinggi (ΔH)	(m)	1,12	0,61
Kemiringan Saluran (I)	(m)	0,00128	0,00090
Luas Area Layanan	(ha)	37,7	30,87
Kemiringan Talud (z)	(m)	0,5	0,5
Luas Penampang (A)	(m^2)	2,41	0,24
Debit Kapasitas (Qkap)	(m^3/dt)	0,361	0,052

3.8. Evaluation of Existing Channels

At this stage, the existing channels are evaluated in relation to the proposed addition of quaternary canals. Based on Figure 3, Channel A is planned to serve three quaternary canals, while Channel B is designed to serve four quaternary canals.

Table 11. Evaluation Results of Channel A

Saluran	Qrenc (m^3/dt)	Total Qrenc (m^3/dt)	Saluran	Qkap (m^3/dt)	Evaluasi Qkap ≥ Qrenc
Kuarter 5	0,019				
Kuarter 6	0,017	0,067	Saluran A	0,361	OK
Kuarter 7	0,017				

Table 12. Evaluation Results of Channel B

Saluran	Qrenc (m^3/dt)	Total Qrenc (m^3/dt)	Saluran	Qkap (m^3/dt)	Evaluasi Qkap ≥ Qrenc
Kuarter 1	0,016				
Kuarter 2	0,015	0,082	Saluran B	0,052	TIDAK OK
Kuarter 3	0,014				
Kuarter 4	0,020				

Based on the evaluation results of both channels presented in Tables 11 and 12, it is found that Channel B is unable to meet the required design discharge.

3.9. Channel Dimension Planning

Referring to the evaluation results in Table 12, Channel B does not have sufficient capacity to supply the required discharge for the quaternary canals, thus dimensional adjustments are necessary. Therefore, a redesign is carried out to ensure that Channel B can accommodate the planned discharge. In this study, the channel is designed using a rectangular concrete cross-section, and the flow velocity is calculated using the Strickler equation (KP-03, 2013).

$$V = K \times R^{2/3} I^{1/2}$$

Description:
V = Flow velocity (m/s)
K = *Strickler coefficient* ($m^{1/2}/s$)
R = Hydraulic radius (m)
I = Channel slope (m)

The Strickler roughness coefficient (K) is determined based on the channel lining material and surface condition, as follows (KP-03, 2013).

1. Saluran Pasangan Beton : K = 70
2. Saluran Pasangan Batu : K = 60
3. Saluran Tanah : K = 35–45

To determine the discharge in irrigation channels, the following hydraulic equation is used (Alfin et al., 2025).

$$Q = A \times V$$

Description:
Q = Discharge (m^3/s)
A = Cross-sectional area (m^2)
V = Flow velocity (m/s)

For the design of quarter channels, a rectangular cross-section with earthen material is applied. The De Vos Table is used to directly determine flow velocity based on discharge values. To calculate the channel slope, the following equation is used (Utama et al., 2022):

$$I = \left(\frac{V}{K \times R^{\frac{2}{3}}}\right)^2$$

Description:
I = Slope (m)
V = Flow velocity (m/s)
R = Hydraulic radius (m)

Table 13. De Vos

Q (m^3/dt)	b/h	V (m/dt)	Kemiringan Talud	K
0 - 0.15	1	0.25 - 0.30	1 : 1	35
0.15 - 0.30	1	0.30 - 0.35	1 : 1	35
0.30 - 0.40	1,5	0.35 - 0.40	1 : 1	35
0.40 - 0.50	1,5	0.40 - 0.45	1 : 1	35
0.50 - 0.75	2	0.45 - 0.50	1 : 1	35
0.75 - 1.50	2	0.50 - 0.55	1 : 1	40
1.50 - 3.00	2,5	0.55 - 0.60	1 : 1.5	40
3.00 - 4.50	3	0.60 - 0.70	1 : 1.5	40
4.50 - 6.00	3,5	0.70	1 : 1.5	40
6.00 - 7.50	4	0.70	1 : 1.5	42,5
7.50 - 9.00	4,5	0.70	1 : 1.5	42,5

Table 14. Results of Channel B Dimension Design and Evaluation Against Design Discharge

Keterangan	Nilai	Satuan
Lebar Bawah (B)	0,60	m
Kedalaman (H)	0,26	m
Tinggi Jagaan (w)	0,40	m
Luas Penampang (A)	0,16	m^2
Keliling Basah Penampang (P)	1,12	m
Jari-Jari Hidrolis (R)	0,14	m
Kemiringan (I)	0,00090	m
Koefisien Stricler (K)	70	$m^{1/3}$/dt
Kecepatan (V)	0,57	m/s
Debit Kapasitas (Q_{kap})	0,088	m^3/dt
Debit Rencana (Q_{renc})	0,082	m^3/dt
Qkap ≥ Qrenc	**OK**	

Table 15. Results of Quarter Channel Dimension Design

Saluran	Q_{renc} (m^3/dt)	H (m)	B (m)	A (m^2)	P (m)	R (m)	I (m)	V_{renc} (m/s)	Q_{kap} (m^3/dt)	Qkap ≥ Qrenc
Kuarter 1	0,016	0,16	0,35	0,056	0,67	0,084	0,00201	0,30	0,017	OK
Kuarter 2	0,015	0,16	0,35	0,056	0,67	0,084	0,00201	0,30	0,017	OK
Kuarter 3	0,014	0,16	0,35	0,056	0,67	0,084	0,00201	0,30	0,017	OK
Kuarter 4	0,020	0,17	0,40	0,068	0,74	0,092	0,00177	0,30	0,020	OK
Kuarter 5	0,019	0,17	0,40	0,068	0,74	0,092	0,00136	0,30	0,020	OK
Kuarter 6	0,017	0,16	0,35	0,056	0,67	0,084	0,00154	0,30	0,017	OK
Kuarter 7	0,017	0,16	0,35	0,056	0,67	0,084	0,00154	0,30	0,017	OK

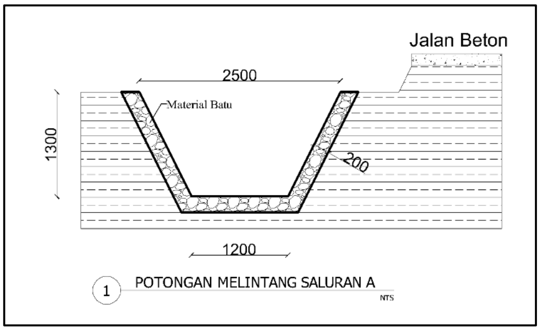

Figure 5. Cross-Section of Channel A Structural Reinforcement Plan

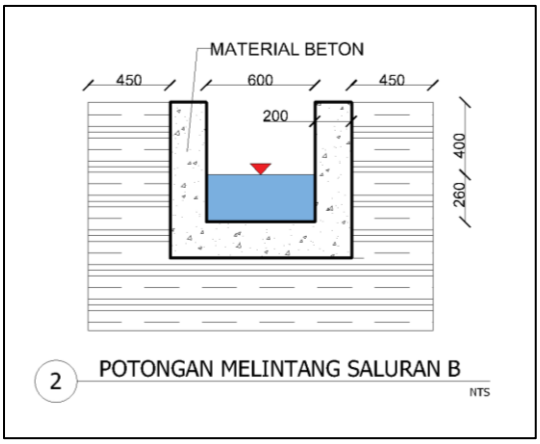

Figure 6. Cross-Section of Channel B Redesign Plan

Figure 7. Cross-Section of Quarter Channel Design for Channels 1, 2, 3, 6, and 7

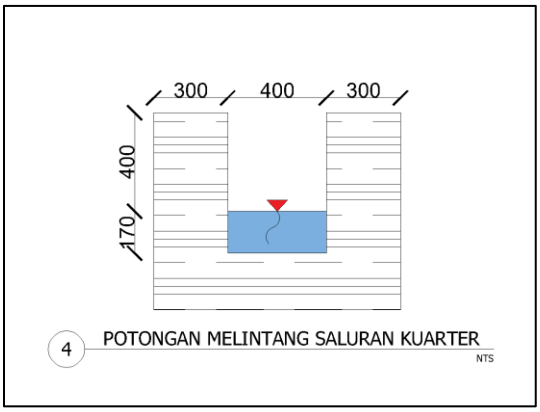

Figure 8. Cross-Section of Quarter Channel Design for Channels 4 and 5

CONCLUSION

Based on the research findings, the maximum Net Field Requirement (NFR) for paddy crops is 0.90 l/s/ha, occurring in the first period of January, while for secondary crops (palawija) it reaches 0.94 l/s/ha in September. The evaluation of channel capacity indicates that Channel A has a capacity of 0.361 m^3/s, which is still sufficient to convey the design discharge. In contrast, Channel B only has a capacity of 0.052 m^3/s, which is inadequate.

Therefore, a redesign of Channel B is required using a rectangular concrete section with a width of 0.60 m, a flow depth of 0.26 m, and a freeboard height of 0.40 m to accommodate the design discharge. Meanwhile, Channel A does not require dimensional modification; instead, structural reinforcement using stone masonry is recommended.

REFERENCE

Alfin, C., Cahyono, H. S., & Khomsiati, N. L. (2025). Analysis And Drainage Planning In Flood Prevention Efforts *AT*. *05*(02), 210–224. https://ejurnal.unisda.ac.id/index.php/dearsip/article/view/10847/4247

Baskoro, A. Y., Suripin, S., & Suprapto, S. (2024). Analisis Evapotranspirasi Metode Penman Modifikasi Dan Thornthwaite Terhadap Pemodelan Debit Fj. Mock. *Media Ilmiah Teknik Sipil*, *12*(1), 39–50. https://doi.org/10.33084/mits.v12i1.6134

BPS Kabupaten Mojokerto. (2023). *Luas Panen dan Produksi Padi di Kabupaten Mojokerto 2023*.

15 Desember 2023. https://mojokertokab.bps.go.id/id/pressrelease/2023/12/15/33/luas-panen-dan-produksi-padi-di-kabupaten-mojokerto-2023.html?utm_source=chatgpt.com

Hendrawan, Z. E., & Mayasari, I. (2021). Optimalisasi Alokasi Air Untuk Irigasi Dengan Menggunakan Progam Linier (Studi Kasus Daerah Irigasi Air Bendungan Laren Lamongan Jawa Timur). *1*(2), 79–92. https://e-jurnal.unisda.ac.id/index.php/dearsip/article/view/2905/1880

Ketmoen, D. (2021). Studi Perencanaan Saluran Tersier Dengan Tinjauan Kecepatan Minimum Aliran Di Daerah Irigasi Kedung Brubus Kecamatan …. *EUREKA: Jurnal Penelitian Teknik Sipil Dan …*. https://publikasi.unitri.ac.id/index.php/teknik/article/view/606

KP-01. (2013). *Standar Perencanaan Jaringan Irigasi Kriteria Perencanaan Bagian Perencanaan Jaringan Irigasi*.

KP-03. (2013). *Standar Perencanaan Irigasi Kriteria Perencanaan Bagian Saluran*.

Rika Oktaviani, & Hermansyah. (2024). Analisis Perencanaan Saluran Irigasi Gunung Tinggi Langkat. *Jurnal Inersia*, *15*(2), 23–27. https://doi.org/10.46964/inersia.v15i2.906

Roostrianawaty, N., & Mahmudah, R. (2023). Perencanaan Dimensi Saluran Irigasi Tersier Jepun Pada Daerah Irigasi Kebonagung Kabupaten Sumenep. *Prosiding SEMSINA*, *4*(01), 276–283. https://doi.org/10.36040/semsina.v4i01.8056

Rosyid Setiawan, A. L. (2023). Perencanaan Jaringan Irigasi Tersier Blok G Daerah Irigasi (D.I) Lempuing Desa Tugu Mulyo Kecamatan Lempuing Kab. Ogan Komering Ilir. *Jurnal Mahasiswa Teknik Sipil*, *2*(1), 93–103. https://journal.unbara.ac.id/index.php/jmts/issue/view/170

Sosrodarsono, S., & Takeda, K. (2003). *Hidrologi Untuk Keairan*.

Sunjani, M., & Hudhiyantoro. (2019). Optimasi Ketersediaan Dan Kebutuhan Air Irigasi Di Daerah Irigasi Nglirip Kabupaten Tuban. *1*(2), 26–42. https://e-jurnal.unisda.ac.id/index.php/dearsip/article/view/2678/1757

Utama, T. S., Saves, F., & Patriadi, A. (2022). Perencanaan Saluran Irigasi Pada Area Persawahan Desa Mejoyo â€“ Kecamatan Bangsal â€“ Kabupaten Mojokerto. *Ge-STRAM: Jurnal Perencanaan Dan Rekayasa Sipil*, *5*(2), 85–92. https://doi.org/10.25139/jprs.v5i2.4700