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Analysis of babi reservoir water management for irigation and raw water in Puyung Village Jonggat District Central Lombok Regency

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ABSTRACT

Babi Reservoir is located at Puyung Village Jonggat District Central Lombok Regency, which accomodate water from HLD (High Level Diversion) Channel of Jurang Sate located in DAS Dodokan is being used to fulfil the irrigation requirement during dry seasons and utilized for various requirement in agriculture fields, livestock and communities. The area of DTA (Catchment Area) of Babi Reservoir are 6,43 km2, potential areal at the location of Babi Reservoir are 150 ha ((Balai Wilayah Nusa Tenggara I, 2021)). Embung Babi services has been not fully utilized by surrounding communities. The availability of water is insufficient, thus the optimization of Embung Babi is essential so the reserved water can be optimally used. This research used evaluative method, by doing collection of primary and secondary data. For maximizing the area of irrigation land, optimization of the irrigation area is carried out by applying cropping pattern, namely Paddy-Paddy-Palawija with type of Palawija is soybean. In optimization model that used is monthly optimization within 1 year by calculation the area of irrigation land that available, area of fulfilled irrigation area, the amount of water availability, and the fulfilled requirement of water for irigation. Optimization method that being used in this calculation is Program Solver. Based on the result of optimization of Babi Reservoir water potential that available for maximum area of irrigation land with cropping pattern Paddy-Paddy-Palawija in early planting of November II with land area of 138,52 ha and planting intentisity of 92,35% within one year. During MT I the irrigation area are 18,83 ha and planting intensity of 12,55%. During MT II the irrigation area are 89,98 ha and planting intensity of 59,99%. Amd for MT III the irrigation area are 29,71 ha and planting intensity are 19,81%.

Keywords: reservoir; irigation; optimization; management; raw water.

INTRODUCTION

Central Lombok Regency is one of region the areas that included in Special Economic Zone (KEK) which is Mandalika. One of the areas located in Central Lombok is Puyung Village, Jonggat District with total population of 1.034.859 including 514.355 of man and 520.504 of woman. Socio-economic condition of communities in Puyung Village mostly work as farmer and breeder with lack of human resources quality and inadequate of economic condition. Agriculture potency possessed by Puyung Village is Paddy, Palawija (soybean) and livestock ((BPS Kab. Lombok Tengah, 2021)).

In processing the land, farmer heavily depending on the water during rainy seasons. Beside of agriculture, the requirement of clean water also only utilizing water from PDAM, beside according to local people the supply of clean water from PDAM still inadequate.

Geographically Babi Reservoir is located at area of Puyung Village, Jonggat District, Central Lombok Regency. Map location can be seen at coordinate (8°40’684” LS, 116°14’517”BT). Located in Dodokan Watershed (DAS), and built in 2009. Catchment Area of Embung Babi are 6,43 km2, potential area at Babi Reservoir are 150 ha ((Balai Wilayah Nusa Tenggara I, 2021)). Babi Reservoir located in Puyung Village Jonggat District is one of the Reservoirs in Central Lombok that has been very important for optimizing irrigation and raw water for community requirement. Babi Reservoir is a Reservoir that purposed to collect water from HLD (High Level Diversion) channel of Jurang Sate which located in DAS Dodokan and utilized for necessity from agriculture, livestock and for community at large. However in practice the clean water from Babi Reservoir cannot be fully utilized by surrounding community.

In terms of quantity, the issue of water shortage is an issue of mismatch in water distribution between necessity and quantities based on time (temporal) and space (spatial). This issue becoming more complex, complicated, and difficult to predict due the water supply that depends on intensity of rain along the year, which is not evenly distributed even during rainy season.

From the illustration above it is necessary to carry analysis of optimizing the management of Reservoir water for irrigation and raw water, so that it can provide benefits in an effort to fulfil the requirement of raw water for community of Desa Salut and increasing production of agriculture in accordance to the program that expected by government and community of Puyung Village Jonggat District Central Lombok Regency.

RESEARCH METHODOLOGY

Hydrology Analysis

Hydrology analysis is a part of initial analysis in planning of water structures. Information and quantities obtained in hydrology analysis is an important input in the next analysis. Hydrology is one aspect that plays an important role, where the success rate of a water structures is influenced by the accuracy in analyzing hydrology. Important hydrology parameter for irrigation networks are rainfall and evapotranspiration (Bambang Triatmodjo, 2020)

Hydrology analysis in general is done in order to obtain hydrological characteristic on Reservoir catchment area. The purpose is to identify characteristic of rain, discharge or water potential that will be used as basis of further analysis. In hydrology analysis, the completeness and availability of hydrology data will greatly affect the result of calculation.

Rainfall Data Consistency Test

Rain data that can be used for solving hydrological issues if there are no data deviation because due to various reasons such as climate change and environmental change. Before rain data is being used the consistency of the data is tested first. RAPS (Rescaled Adjusted Partial Sums) is used as method of data consistency test, used for testing inaccuracies between data within the station itself by detecting a shift of mean value. The equation used is as follows (Sri Harto, 2000):

$$S_k{}^{**} = \frac{S_k{}^{**}}{D_y} \quad \ldots\ldots(1)$$

$$D_y{}^2 = \frac{\sum_{i=1}^{k}(Y_i - Y)^2}{n} \quad \ldots\ldots(2)$$

$$S_k{}^{*} = \sum_{i=1}^{k}(Y_i - Y) \quad \ldots\ldots(3)$$

with :

n = total of rain data
Yi = data of rainfall
Y = mean of rainfall
$S_k{}^*$, $S_k{}^{**}$, D_y = statistic value
K = 1,2,3, … , n

Water Availability Analysis

For analyzing water availability by determining reliable discharge, basic year planning method is used with 80% and 50% probability of reliability. The steps in the process of reliable discharge determination using basic year method are as follows:

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a. Adding up all monthly or semi-monthly low-flow discharges to total annual low-flow discharge
b. Sort the total annual low-flow discharge from large to small
c. Calculating the probability of each low-flow discharge using Weibull equation
d. Determining reliable discharge according to the searched probability, in general the ratio of crop failure will be small if planning for paddy using Q80% while for palawija using Q50%
e. Probability equation using the equation (Standar Perencanaan Irigasi (KP. 01-09), 2013) :

$$P = \frac{1}{(n+1)} \times 100 \quad \ldots(4)$$

$$Q_{80} = \frac{m}{n+1} \times 100\% \quad \ldots(5)$$

with :
P = Probability of Rainfall occurring
M = Order number (ranking)
N = number of observations

Water Irrigation Requirement Analysis

Irrigations water requirement can be known by calculating plants water requirement. The amount of water requirement for plants is influenced by several factors, such as: Evapotranspiration that influenced by temperature, humidity, wind speed, air preassure and sunlight which are interconnected to one another. Evapotranspiration is a basic factor for determining water requirement and an important process in hydrological cycle. Calculation of potential evapotranspiration was calculated by Penman method (FAO modification) with closest climatology data as a reference station. FAO (Food and Agriculture Organization) modified Penman equation is as follows (Sri Harto, 2000):

ETo = c. (W . Rn + (1-W)) . f(u) . (ea-ed) ……………………………………………………(6)

with:
Eto = reference plant evatranspiration (mm/day)
W = temperature and altitude factor
Rn = clean radiation (mm/day)
f(u) = wind speed function
ea = saturated vapor pressure (mbar)
ed = real vapor pressure (mbar)
c = wind temperature compensation factor and humidity

Water requirement at fields

Water requirement for plants can be calculated based on time of planting and type of plants. The planned cropping patter are Palawija-Palawija-Bero, and Palawija-Palawija-Palawija. The amount of water needed in the field can be calculated with equation as follows (Peraturan Pemerintah No. 20 Tahun 2006 Tentang Irigasi, 2006):

NFR = (ETc - Re ff) x $\frac{1}{8,64}$ ……………………………………………………………(7)

with
NFR = water requirement at fields (mm/day)
ETc = water requirement for plants (mm/day)
Reff = effective rain (mm/day)
8,64 = conversion factor from mm/day to ltr/dt/ha.

Irrigation efficiency

Referring to Direktorat Jendral Sumber Daya Air (2013), the overall irrigation efficiency is taken as 90% and the tertiary level is 80%. The overall efficiency irrigation figures is calculated by converting the efficiency at each level, namely 0,9 x 0,9 x 0,8 = 0,648 ≈ 65%.
Mathematically the need for irrigation water can be formulated as follows:
For paddy plants

$$I = \frac{ETc+E+P+W+G-Re}{Efficiency} \quad (8)$$

For Palawija plants

$$I = \frac{ETc-Re}{Efficiency} \quad (9)$$

with:
I = total need of water for irrigation in main building (mm/day)
ETc = water for consumptive requirement (mm/day)
W = stagnant water in crop plots/fields (mm/day)
G = replacement of stagnant water/seedbed requirement (mm/day)
P = percolation (mm/day)
Eo = evaporation of opened water (mm/day)
Ref f = effective rainfall (mm/day)

Raw Water Requirement Analysis

In the service of meeting the requirement of raw water for the community, the important matter is to estimate the amount of water needed every year where it is necessary for collect information regarding numbers of population that will be served and water usage with an analysis from factors that influencing water consumption, such as number of population factor, socio-economic level, industry, commerce, education and other facilities.

Table 1. Standard water requirement for various sectors

Type of usage	Standard	Unit
Domestic		
1. City with population : - 1 million	250	lt/person/day
2. City with population = 1 million	150	lt/person/day
3. Rural	100	lt/person/day
4. Public faucet	30	lt/person/day
Non Domestic		
1. Fire Hydrant	5	% domestic req.
2. Leakage	20	% domestic req.
3. School	10	mm/day
4. Office	10	peg/day
5. Worship place	2	
Industry	0.4 - 1	det/ha
Commercial		
1. Airport	10 - 20	Passanger/day
2. Terminal / Bus station	3	Passanger/day
3. Harbour	10	Passanger/day
Health Facility		
1. Hospital	300	lt/day

Source: Standar Nasional Indonesia Penyusunan Neraca Sumber Daya Air, 2002))

Table 2. Standard water requirement based on city category

No	Type of Water Usage	City Level		
		Province	Regency	District

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1	General Service	35 % D	25 % D	10 % D
2	Industry	25 % D	20 % D	20 % D
3	Trade	25 % D	20% D	15 % D
4	Lost Water	15 % D	15 % D	10 % D

(Source : (Standar Perencanaan Irigasi (KP. 01-09), 2013)*)*

Raw water requirement including domestic water requirement is a household water requirement for various purposes such as: cooking, bathing, washing, and others. For domestic requirement, it is calculated based on number of population that will be served (Pt) multiply by standard water requirement water/litre/day (S). In form of calculated formula as follows (Standar Nasional Indonesia Penyusunan Neraca Sumber Daya Air, 2002)) :

qD = Pt x S ………………………………………………………………………..…….(10)

with :
qD = domestic water requirement (lt/day)
Pt = number of populations that will be served (person)
S = average standard of water requirement (lt/person/day)

Optimization model

Optimization calculation using program solver. Reservoir system schematic is as shown in the following figure :

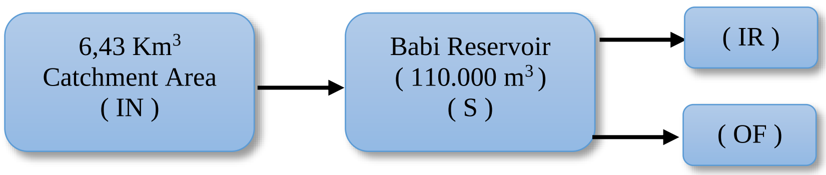

Figure 1. Babi Reservoir Network Schematic

with:
IN = amount of inflow water to the reservoir
S = volume of reservoir
IR = amount of water from reservoir for irrigation purposes
OF = reservoir outflow passing spillway

Result of optimization for various cropping pattern system both implemented in the field (existing) and planned cropping pattern with different initial shifts of cropping. Subject to the Constraints in program solver with:

1) K196 : K217 <= J196 : J217
   Means : irrigation area from rows K196 to K217 must be less than the irrigation planned area for J196 to J217 (150 ha).
2) K196 : K217 >= 0
   Means : irrigation area from rows K196 to K217 must be greater or equal to 0.
3) (K197,….K203) = K196
   Means : irrigation area from rows K197 to K203 same with rows K196.
4) (K205,….K211) = K204
   Means : irrigation area from rows K205 to K211 same with rows K204.
5) (K213,….K17) = K212
   Means : irrigation area from rows K213 to K217 same with rows K212.
6) L196 : L217 <= N196 : N217
   Means : water irrigation requirement from rows L196 to L217 is less or same with water availability on rows N196 to N217.
7) S196 : S217 >= 0
   Means: reservoir capacity from rows S196 to S217 is greater or equal to 0.

Research Flowchart

The following is a flowchart of the stages of the research which is outlined below:

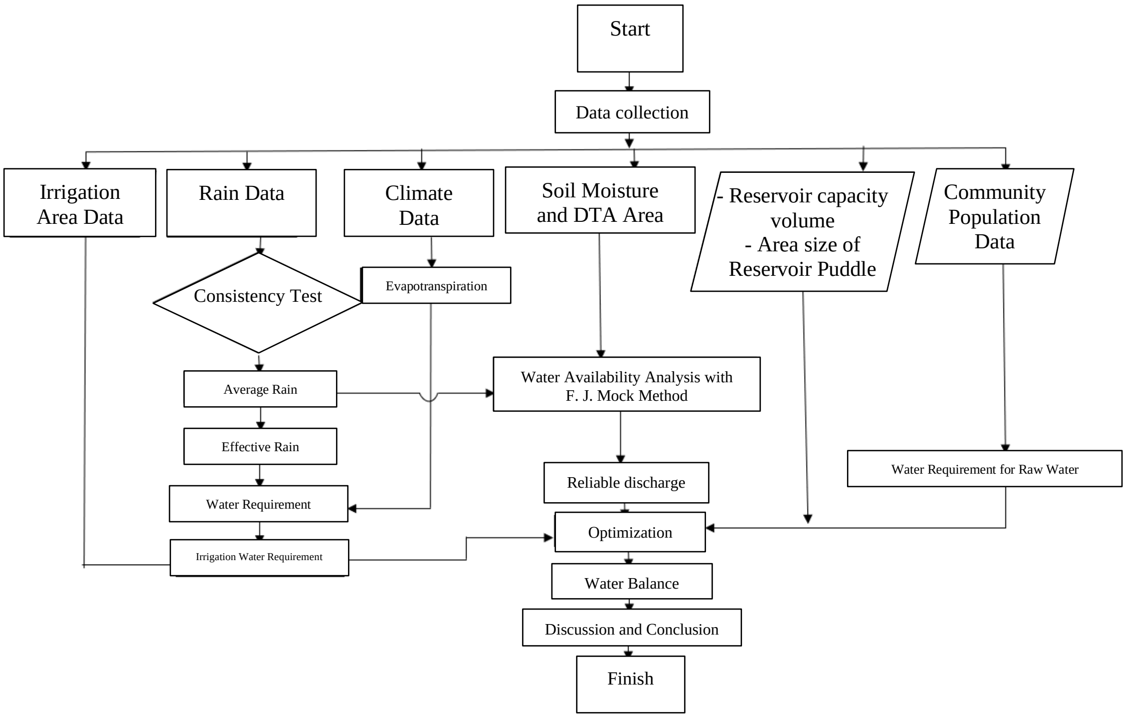

Figure 2. Research Flowchart

RESULT AND DISCUSSION

Rainfall Data Consistency Test

Rainfall data consistency test was done by using RAPS method (Rescaled Adjusted Partial Sums). RAPS method consistency test analysis at Pengadang Station as the closest station with Babi Reservoir use the data from period of 2011 until 202, with data length of 10 years.

n	= 10
Dy	= 343,51
Sk** min	= -0,77
Sk** maks	= 0,000
Qy = |Sk** maks |	= 2,120
Ry = Sk** maks - Sk** min	= 0,774
Qy/(n^0,5) Table 95%	= 0,670 < 1,14 Ok
Ry/(n^0,5) Table 95%	= 0,245 < 1,28 Ok

Based on test of RAPS rainfall data, it was obtained value of $Q/\sqrt{n}<Q/\sqrt{n}$ permits 95% and $R/\sqrt{n}<R/\sqrt{n}$ permits 95% fulfil the requirements and the rain data used is consistent

Water Availability Analysis

Reliable discharge according to sought probability, in general the ration of crop failure will be small if the planning for paddy field use Q80% while Palawija use Q50%

Example of reliable discharge calculation:

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1. Total data of Babi Reservoir Inflow:
   Year 2011 = 0.39 m³/sec   Year 2016 = 3,43 m³/sec
   Year 2012 = 0,22 m³/sec   Year 2017 = 2,58 m³/sec
   Year 2013 = 1,40 m³/sec   Year 2018 = 1,96 m³/sec
   Year 2014 = 2,06 m³/sec   Year 2019 = 2,57 m³/sec
   Year 2015 = 1,99 m³/sec   Year 2020 = 2,59 m³/sec

2. From total of inflow sorted from big to small:
   Year 2016 = 3,43 m³/sec   Year 2015 = 1,99 m³/sec
   Year 2020 = 2,59 m³/sec   Year 2018 = 1,96 m³/sec
   Year 2017 = 2,58 m³/sec   Year 2013 = 1,40 m³/sec
   Year 2019 = 2,57 m³/sec   Year 2011 = 0,39 m³/sec
   Year 2014 = 2,06 m³/sec   Year 2012 = 0,22 m³/sec

3. Probability calculation in 2012

$$P = \frac{1}{(10+1)} \times 100 = 9{,}091\%$$

Position Q80% placed at probability of 72,73% and 81,82% so it need interpolation calculation for achieving value Q80%. Q80% for January I is as follows:

- $Q_{80} = \frac{m}{n+1} \times 100\%$
- $Q80\% = 2{,}00 + \left(\frac{(80-72{,}73)}{(81{,}82-72{,}73)}\right) \times (0{,}55 - 2{,}00)$
- $Q80\% = 0{,}84\ m^3/sec$

For next month calculation can be seen from Table 3. Based on result of Basic Year analysis, it was obtained inflow volume of Babi Reservoir, can be seen on Table 4.

Table 3. Basic Year Method of Reliable Discharge

No	Tahun	Januari		Februari		Maret		April		Mei		Juni		Juli		Agustus		September		Oktober		November		Desember		Prob %
		I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	
1	2011	0,55	0,17	0,45	0,24	0,14	0,66	0,71	0,81	0,47	0,36	0,71	0,81	0,36	0,36	0,14	0,17	0,17	0,17	0,14	0,14	0,03	0,28	0,48	0,76	81,82
2	2012	0,32	0,10	0,26	0,14	0,08	0,38	0,41	0,47	0,27	0,21	0,41	0,47	0,21	0,21	0,08	0,10	0,10	0,10	0.08	0.08	0,02	0,16	0,28	0,44	90,91
3	2013	2,00	0,63	1,65	0,87	0,52	2,35	2,56	2,91	1,67	1,31	2,56	2,91	1,31	1,31	0,52	0,65	0,63	0,65	0,51	0,51	0,10	0,99	1,72	2,72	72,73
4	2014	2,94	0,93	2,43	1,28	0,77	3,45	3,77	4,28	2,46	1,93	3,77	4,28	1,93	1,93	0,77	0,95	0,93	0,95	0,75	0,75	0,14	1,45	2,53	4,00	45,45
5	2015	2,84	0,90	2,35	1,24	0,74	3,34	3,65	4,14	2,38	1,87	3,65	4,14	1,87	1,87	0,74	0,92	0,90	0,92	0,73	0,73	0,14	1,40	2,45	3,87	54,55
6	2016	4,89	1,56	4,06	2,13	1,28	5,75	6,30	7,14	4,10	3,23	6,30	7,14	3,23	3,23	1,28	1,58	1,56	1,58	1,25	1,25	0,24	2,42	4,23	6,68	9,09
7	2017	3,68	1,17	3,05	1,60	0,96	4,32	4,74	5,37	3,08	2,43	4,74	5,37	2,43	2,43	0,96	1,19	1,17	1,19	0,94	0,94	0,18	1,82	3,18	5,02	27,27
8	2018	2,79	0,89	2,31	1,21	0,73	3,27	3,59	4,07	2,33	1,84	3,59	4,07	1,84	1,84	0,73	0,90	0,89	0,90	0,71	0,71	0,14	1,38	2,41	3,80	63,64
9	2019	3,67	1,17	3,04	1,59	0,96	4,30	4,72	5,36	3,06	2,42	4,72	5,36	2,42	2,42	0,96	1,18	1,17	1,18	0,93	0,93	0,19	1,81	3,17	5,00	36,36
10	2020	3,70	1,18	3,06	1,60	0,97	4,33	4,75	5,40	3,08	2,44	4,75	5,40	2,44	2,44	0,96	1,19	1,18	1,19	0,94	0,94	0,19	1,82	3,19	5,04	18,18
Rata-rata		2,74	0,87	2,27	1,19	0,72	3,22	3,52	4,00	2,29	1,80	3,52	4,00	1,80	1,80	0,71	0,88	0,87	0,88	0,69	0,69	0,14	1,35	2,36	3,73	50,00
Q50 (m3/dt)		2,89	0,92	2,39	1,26	0,76	3,40	3,71	4,21	2,42	1,90	3,71	4,21	1,90	1,90	0,76	0,94	0,92	0,94	0,74	0,74	0,14	1,43	2,49	3,94	48,58
Q80 (m3/dt)		0,84	0,26	0,69	0,37	0,22	1,00	1,08	1,23	0,71	0,55	1,08	1,23	0,55	0,55	0,22	0,27	0,26	0,27	0,21	0,21	0,04	0,42	0,73	1,15	14,14

Source: Calculation Result

Based on reliable discharge analysis by using Basic Year method, it was obtained the largest reliable discharge of Babi Reservoir occurred in Aprill II with reliability of 80% (Q80) with value of 1,23 m^3/sec. While the largest reliable discharge occurred in June II with reliability of 50% (Q50) with value of 4,21 m^3/det.

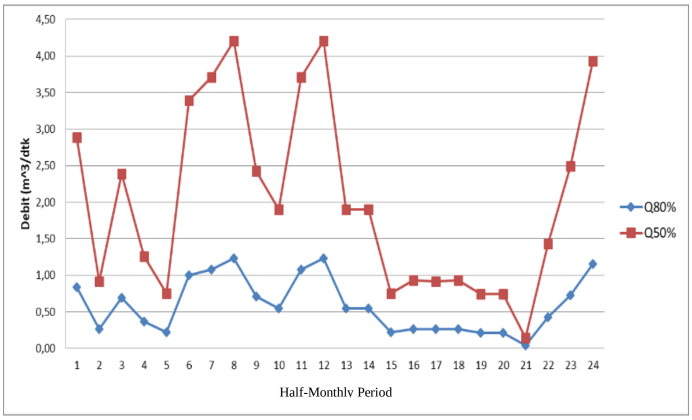

Figure 3. Graph of Reliable Discharge Relationship of Babi Reservoir for Half-Monthly Q80% and Q50%

Water Requirement for Irrigation Analysis

Water requirement for Babi Reservoir is based on existing cropping pattern and emphasized on management at water distribution level. This is due to the habit of people's cropping pattern along Babi Reservoir irrigation channel which quite difficult to change.

Table 4. Recapitulation of Water Requirement for Babi Reservoir

No	Half-Monthly	DR (lt/dt/ha)			
		Nop-I	Nop-II	Des-I	Des-II
1	Nov-1	1,39	0,98	0,33	0,11
2	Nov-2	1,20	1,23	0,88	0,29
3	Dec-1	0,51	0,82	0,89	0,65
4	Dec-2	0,69	0,84	1,10	1,07
5	Jan-1	0,47	0,53	0,75	1,05
6	Jan-2	0,75	1,05	1,08	1,04
7	Feb-1	0,24	0,50	0,74	0,81
8	Feb-2	0,25	0,51	0,85	0,95
9	Mar-1	0,22	0,10	0,25	0,78
10	Mar-2	0,42	0,36	0,33	0,59
11	Apr-1	0,42	0,47	0,38	0,42
12	Apr-2	0,46	0,59	0,55	0,45
13	May-1	0,42	0,50	0,60	0,55
14	May-2	0,33	0,41	0,48	0,62
15	Jun-1	0,26	0,42	0,49	0,49
16	Jun-2	0,19	0,33	0,51	0,55
17	Jul-1	0,03	0,14	0,25	0,49
18	Jul-2	0,23	0,14	0,18	0,35
19	Aug-1	0,39	0,29	0,17	0,21
20	Aug-2	0,55	0,52	0,36	0,21
21	Sep-1	0,46	0,54	0,48	0,30
22	Sep-2	0,12	0,24	0,29	0,35
23	Oct-1	0,37	0,09	0,19	0,22
24	Oct-2	1,07	0,47	0,23	0,15

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Maximum	**1,39**	**1,23**	**1,10**	**1,07**
Average	**0,48**	**0,50**	**0,52**	**0,53**

Source: Calculation Result

Based on the calculation result on table 4 of recapitulation data of water requirement for Babi Reservoir, it was obtained result of maximum water requirement of 1,39 lt/dt/ha and minimum water requirement of 1,07 lt/dt/ha. On Nop-1 calculation, maximum occurred in month Nov-2, Nop-2 maximum occurred in month Nov-2. While Des-1 calculation, maximum occurred on Des-2, Des-2 occurred on month Des-2.

Optimization Analysis

In optimization analysis, a program solver is used which involves elements of irrigation water requirement, raw water requirement, and discharge data. Optimization analysis at initial planting of November II with cropping pattern Padi-Padi-Palawija is as follows:

Domestic raw water requirement (Pt x S)= 40 x 12081 lt/person/day (Type of usage in rural area)
= 483.240 m^3/person/day
= 483,24 x 15 days
= 7.248,6 m^3/person/15 days

Irrigation land area = 150 ha

irrigation water requirement = result of irrigation water requirement
= 120,17 /ha

planned irrigation water requirement = total irrigation water req. x irrigation field area
= 120,17 x 18,83 ha
= 2.262,88 /ha

Fulfilled irrigation field area = running program (solver)
= 18,83 ha

Evaporation = (Evaporation *puddle area)
= ((57,60 mm / 1000)* 3600
= 207,36 m^3/15 days

fulfilled water requirement = (irrigation water req. x fulfilled irrigation field area + total total raw water req.)
= (120,17 x 18,83 + 7.248,6)
= 9.511,48 m^3

Inflow = reliable discharge Q50
= 181.440 m^3

water availability = reservoir capacity volume + inflow
= 110.000 + 181.440
= 291.440 m^3

final reservoir capacity (St+1) = running program (solver)
= 110.000 m^3

Intensity = (fulfilled irrigation area : irrigation area) x 100
= (18,83 : 150) x 100
= 12,55 %

Optimization result with cropping pattern Paddy-Paddy-Soybean, with each initial planting of November II and December I, it was found that water potential that exist in Babi Reservoir with maximum intensity occurred in cropping pattern of initial planting November II which shows planting intensity of 138,52% during one year. In MT I area of Babi Reservoir irrigation field area which can be irrigated are 18,83 ha with planting intensity of 12,55%. In MT II area of Babi Reservoir irrigation field area which can be irrigated are 89,98 ha with planting intensity of 59,99%. While for MT III area of Babi Reservoir irrigation field area which can be irrigated are 29,71 ha with planting intensity of 19,81%. Optimization result in initial planting of December shows that planting intensity occurred 123,45% during one year. In MT I area of Babi Reservoir irrigation field area which can be irrigated are 21,20 ha with planting intensity of 14,13%. In MT II area of Babi Reservoir irrigation field area which can be irrigated are 89,98 ha with planting intensity of 59,99%. While for MT III area of Babi Reservoir irrigation field area which can be irrigated are 12,77 ha with planting intensity of 8,18%.

By looking from the result of optimization which shows optimum intensity result occurred in initial planting of November II and looking on initial planting of December I there is excessive runoff which shows that a lot of water is wasted and the result of intensity optimization for initial planting of November II is less compared with initial planting of December I, thus the suggested initial planting for study location is using initial planting of November II.

Based on optimization result of Water Balance in Babi Reservoir shows that amount of water availability towards amount of water requirement can be fulfilled. The potential of water shortage or water deficit occurred in the end of January and early February.

While for raw water requirement with water requirement per person 40 lt/person/day, based on the calculation result, raw water requirement of Babi Reservoir was obtained with value of 7.248,6 m^3/15 days. Raw water requirement that can be supplied by Babi Reservoir for people in Puyung Village and the surrounding are approximately 0,59 m^3/second (Q80), thus the Babi Reservoir is able to irrigate the entire Puyung Village and the surrounding.

CONCLUSION

Based on the analysis result and calculation performed, it can be concluded as follows: Babi Reservoir water availability with average reliable discharge for half-monthly with reliability of 80% (Q80) is 0,59 m^3/sec and Reliability 50% (Q50) are 2,02 m^3/sec. Babi Reservoir raw water requirement obtained is 7.248,6 m^3, while for irrigation water requirement is 44.200,64 m^3/ha, and fulfilled irrigation water requirement is 944.150,13 m^3. Based on optimization result of Water Balance in Babi Reservoir shows that amount of water availability towards amount of water requirement can be fulfilled. The potential of water in Babi Reservoir gives maximum field area with cropping pattern Paddy-Paddy-Soybean in initial planting of November II that shows field area occurred of 138,52 ha during one year. In MT I irrigation field area that able to be irrigated are 18,83 ha. In MT II irrigation field area that able to be irrigated are 89,98 ha. While in MT III irrigation field area that able to be irrigated are 29,71 ha. Based on the optimization result obtained, people of Puyung Village and the surrounding get water supply from Babi Reservoir.

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