# The Effect of Telaga Tunjung Dam Operation on Area of Irrigation Water Services in Tabanan Regency

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**Abstract.** Changes in the hydrological cycle affect the equilibrium of water entry and exit in reservoirs. As reservoirs age, sediment buildup reduces their functionality. Telaga Tunjung Dam was built to support irrigation, clean water supply, flood control, and tourism. Telaga Tunjung Dam is located in Timpag Village, Kerambitan District, Tabanan Regency at the Yeh Hoo River. Reservoir operations are analyzed using water balance simulations, where inflow (discharge and rainfall) and outflow (water supply, irrigation, and losses) are considered. The reservoir is deemed ineffective when filled with sediment. The results of the operation simulation are in the form of a rule curve which is the operating rule for each state of the reservoir. The irrigation area that can be irrigated by the Telaga Tunjung Dam is 1,185 ha, including Subak Meliling 300 ha, Subak Gadungan 476 ha, and Subak Sungsang 409 ha. The clean water service at Telaga Tunjung Dam is currently 20 l/sec.

**Keywords:** Area of Irrigation, Capacity, Dam, Operation of Reservoirs, Sediment

## 1 Introduction

Reservoir operations are declared to be still optimal if the reservoir operation simulation shows that the reservoir water volume is still above the Minimum Operating Level. The filling of water at the Telaga Tunjung Dam was carried out on January 20, 2007, the reservoir was immediately full at an elevation of 199.00. After 15 years of operation of the Telaga Tunjung Dam, it is very important to conduct a study on the operation of the reservoir at the Telaga Tunjung Dam. Reservoir sediment and hydroclimatological conditions will influence the effectiveness of reservoir operations, which directly affects the extent of irrigation services and clean water services (Nugraha, 2016).

The irrigation areas that serve the Telaga Tunjung Dam are the Meliling Irrigation Area, the Gadungan Irrigation Area, and the Sungsang Irrigation Area. The planting pattern in the irrigation area which is the Telaga Tunjung Dam service area is currently not effective, as shown by the planting pattern in the Gadungan irrigation area which is only able to plant rice once a year (Ministry of Public Work, 2018).

Operation and maintenance of a reservoir that does not follow established procedures will reduce the effectiveness of the reservoir, and can even endanger the safety of the reservoir. The risk of a reservoir occurring is mostly caused by inadequate exploitation and maintenance, as well as negligence that may seem insignificant, but can result in


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very fatal things. These negligences are also caused by a lack of careful work during, pre-design, design, and during construction, thus causing problems during the operation and maintenance of a reservoir (Sosrodarsono & Kesaku, 1981).

## 2 Methodology

### 2.1 Research Design

Research was conducted at the Telaga Tunjung Dam in Tabanan Regency, using quantitative descriptive research methods. The quantitative descriptive method aims to create a systematic, factual, and accurate description or picture of a phenomenon or the relationship between the phenomena being investigated. In general, research is carried out in the form of collecting information (secondary data and primary data), field surveys, problem analysis, determining analysis methods and discussion methods.

### 2.2 Data Source

Primary data for this research were obtained through surveys, field observations of reservoir conditions, including sediment, and interviews with Subak members and dam operators. Secondary data included reservoir storage measurements, capacity curves, hydroclimatological data (rainfall and evaporation), irrigation area and water demand, non-irrigation water needs, and population and social condition data.

### 2.3 Method of Collecting Data

Data collection methods included direct observations at the Telaga Tunjung Dam to assess sedimentation, operations, and the surrounding environment. Interviews were conducted with Subak members, dam guards, operators, and local village officials. Additionally, a literature study was performed to gather standards for calculations, sedimentation, and reservoir operations, and to reference relevant sources from libraries and online journals.

### 2.4 Data Analysis Method

The data analysis involved several key steps: First, the irrigation water needs were analyzed and calculated in liters per second per hectare (lt/dt/ha). Second, the mainstay water flow, or dependable discharge, was calculated to determine the quantitative value of the water discharge available throughout the year, including both the dry and rainy seasons. This was achieved using the basic year planning method. Finally, a simulation of the reservoir operation patterns was conducted, focusing on the relationship between inflow, outflow, and reservoir storage. The equation for the reservoir operation simulation is provided below (Ministry of Public Works, 2013).

$$I - O = {}^{ds}/_{dt} \quad (1)$$

$$V_t = V_{t-1} + I_t + R_t - E_t - O_t - O_{st} \quad (2)$$

Where :

$I$ = Inflow per unit time, $m^3$

$O$ = Outflow per unit time, $m^3$

${}^{ds}/_{dt}$ = Change in storage per unit time, $m^3$

$V_t$ = Reservoir storage in period t

$V_{t-1}$ = Reservoir storage in period t-1

$I_t$ = Reservoir inflow in period t

$R_t$ = Rain that falls on the surface of the reservoir, in period t

$E_t$ = Water loss due to evaporation in period t

$O_t$ = Total water requirement

$O_{st}$ = Outflow from the spillway

Inflow is river flow that enters the reservoir and rainfall that falls on the surface of the reservoir. Outflow consists of reservoir releases for irrigation, raw water and river conservation needs, etc (Sudjarwadi,1989). The amount of reservoir release for irrigation or other needs is determined based on calculations from analysis of irrigation and other water needs, while the amount needed for river conservation is determined to be at least equal to the base flow (Tarigan, 2014). Apart from that, water runoff from spillways and evaporation from the reservoir surface are also calculated as outflow. The change in reservoir capacity is the magnitude of the change in reservoir volume which refers to the curve of the reservoir capacity in question (Ahmadi et al., 2017).

# 3 Result and Discussion

## 3.1 Telaga Tunjung Dam Technical Data and Dam River Basin

**Telaga Tunjung Dam Technical Data.** In 2015, a study was carried out at the Telaga Tunjung Dam regarding measuring the volume and inundation area of the reservoir. The inundation area of the Telaga Tunjung Dam reservoir is at the flood water level with an elevation of + 201.51 m covering an area of 21.5 Ha. At normal water level with an elevation of + 199.00 m covering an area of 17.5 Ha. At the minimum water level with an elevation of + 190.70 m, an area of 2.5 Ha.

The type of dam is zonal fill, the river bed elevation of the dam is +174.00 m, the length of the dam beacon is 250 m, the width of the dam crest is 6 m at an elevation of +203.00, the dam body volume is 251,000 $m^3$. The spillway type is an ogee side spillway without doors, the lighthouse elevation is +199.00 m, the lighthouse length is 93 m, the energy distribution building type is USBR type III. The intake building type is a square conduit tower, Butterfly valve and Hollow cone valve operating equipment type, intake capacity 1.866 $m^3/s$, flasing capacity 4.00 $m^3/s$ (Ministry of Public Works, 2018).

**Telaga Tunjung Dam River Basin.** Telaga Tunjung Dam is located in Timpag Village, Kerambitan District, Tabanan Regency. Hydraulically, this dam is located downstream of the confluence of the Yeh Hoo River as the main river and the Yeh Mawa River**.** The catchment area of the Telaga Tunjung Dam is 93.99 $km^2$ with a river length of 9.2 km.

### 3.2 Hydrology

The distribution of rain stations at Telaga Tunjung Dam is Jatiluwih rain station, Megati rain station and Gadungan rain station. The catchment area of the Telaga Tunjung Dam is a sub-catchment area of the Tukad Yeh Hoo River. The Tukad Yeh Hoo River catchment area has a tropical climate, with the wet months between December and May, and the dry months between June and November. The amount of rain per year in the Tukad Yeh Hoo river basin varies between 1400 mm to 2800 mm. The average temperature in the Tukad Yeh Hoo river basin is 25.5°C, the average relative humidity is 88%. The average wind speed is 15.5 km/hour, the average solar radiation is 50% (Soemarto, 1999).

### 3.3 Irrigation Service Area

The irrigation service area at the Telaga Tunjung Dam is partly included in the Kerambitan District area and partly in the East Selemadeg District area. In Kerambitan District, the villages that use irrigation services are Timpag Village, Meliling Village, Baturiti Village, Tista Village, Lumbang Village, Tibubiyu Village. Meanwhile, in Selemadeg Timur District, the villages that use irrigation services are Gadungan Village, Batas Village, Mambang Village, Tanguntiti Village, Beraban Village.

### 3.4 Reservoir Simulation

Reservoir operations are efforts to optimally utilize the water stored in the reservoir's effective storage. Analysis of reservoir operations is based on the concept of continuity or water balance where the difference between inflow and outflow is the storage for each operating period (Sutopo, 2010) . It is concluded that the reservoir is no longer effective when the reservoir is full of sediment. The method used is water balance simulation in the reservoir. Input data is in the form of discharge entering the reservoir and rainfall entering the reservoir surface, while output is in the form of supplies of raw water and irrigation water as well as other losses.

### 3.5 Reservoir Capacity Curve

Reservoir capacity can be known from the reservoir capacity curve. Storage Capacity Curve of Reservoir is a curve that describes the relationship between water surface area, Storage Capacity with Reservoir Water Level, so you can know how much storage is at a certain elevation (Samosir et al., 2010). The capacity curve of the Telaga Tunjung Dam is presented in Figure 1.

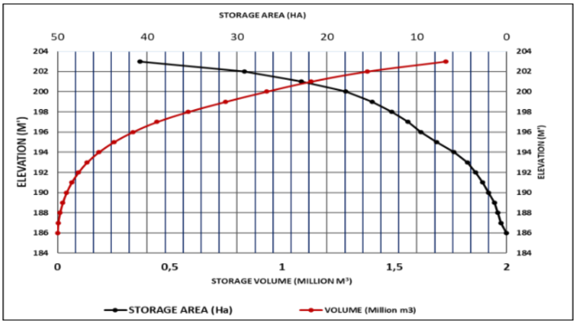


**Figure 1.** Capacity curve of Telaga Tunjung Dam

## 3.6 Effective Rainfall

Effective rainfall is rainfall that can be used directly for plant growth. The calculation of effective rainfall is adjusted to the water needs for each type of planned plant, namely rice and secondary crops. The rain data used is rain data for the last 10 years.

**Table 1.** Effective rainfall

| Month | Period | $R_{eff}$ paddy | $R_{eff}$ secondary crops | Month | Period | $R_{eff}$ paddy | $R_{eff}$ secondary crops |
|---|---|---|---|---|---|---|---|
| Jan | I | 3.78 | 12.50 | July | I | 0.00 | 0.50 |
| | II | 3.73 | 9.63 | | II | 0.27 | 2.42 |
| | III | 3.75 | 9.63 | | III | 0.05 | 0.45 |
| Feb | I | 3.73 | 10.46 | August | I | 0.01 | 0.35 |
| | II | 3.54 | 9.06 | | II | 0.00 | 0.38 |
| | III | 2.52 | 7.75 | | III | 0.00 | 0.19 |
| March | I | 2.93 | 8.03 | Sept | I | 0.06 | 0.80 |
| | II | 2.16 | 6.76 | | II | 0.00 | 0.20 |
| | III | 1.87 | 5.82 | | III | 0.00 | 0.65 |
| Apr | I | 2.68 | 6.33 | Oct | I | 0.49 | 4.20 |
| | II | 1.33 | 6.27 | | II | 0.32 | 3.49 |
| | III | 0.32 | 4.34 | | III | 0.53 | 5.12 |
| May | I | 0.57 | 3.90 | Nov | I | 1.68 | 6.93 |
| | II | 0.15 | 2.64 | | II | 2.63 | 10.56 |
| | III | 0.57 | 4.22 | | III | 2.85 | 7.13 |
| June | I | 0.26 | 1.86 | Dec | I | 4.81 | 9.40 |
| | II | 0.00 | 0.91 | | II | 3.26 | 9.55 |
| | III | 0.04 | 1.06 | | III | 3.93 | 8.54 |

### 3.7 Irrigation Water Requirements

Calculations of irrigation water requirements are carried out based on irrigation planning standards. The need for irrigation water in the Telaga Tunjung Dam service area is presented in the following table:

**Table 2.** Irrigation Water Requirements

| Month | Period | Irrigation water needs ( l/s/ha) | Month | Period | Irrigation water needs ( l/s/ha) |
|---|---|---|---|---|---|
| Jan | I | 0.37 | July | I | 0.26 |
| | II | 0.49 | | II | 0.09 |
| | III | 0.51 | | III | 0.03 |
| Feb | I | 0.21 | August | I | 0.07 |
| | II | 0.52 | | II | 0.13 |
| | III | 0.54 | | III | 0.18 |
| March | I | 0.53 | Sept | I | 0.23 |
| | II | 0.75 | | II | 0.34 |
| | III | 0.79 | | III | 0.48 |
| Apr | I | 0.69 | Oct | I | 0.58 |
| | II | 0.75 | | II | 0.61 |
| | III | 0.75 | | III | 0.43 |
| May | I | 0.65 | Nov | I | 0.22 |
| | II | 0.65 | | II | 0.24 |
| | III | 0.57 | | III | 0.53 |
| June | I | 0.52 | Dec | I | 0.43 |
| | II | 0.44 | | II | 0.40 |
| | III | 0.36 | | III | 0.18 |

### 3.8 Dependable Discharge Analysis

The calculation of the reliable discharge is intended to find the quantitative value of the discharge available throughout the year, both in the dry season and the rainy season. The reliable discharge can be determined using the basic year planning method (Ahmadi et al., 2017).

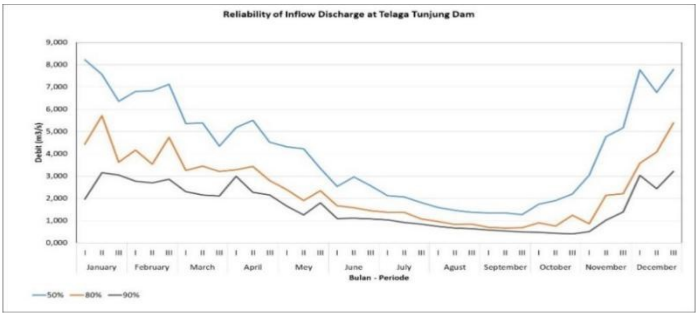


**Figure 2.** Reliability of inflow discharge at Telaga Tunjung Dam

### 3.9 Reservoir Rule Curve

After carrying out a reservoir simulation under existing operating conditions, the simulation is then carried out again with modifications to the inflow data. 50% reliable discharge input data is called a wet year, 80% reliable discharge input data is called a normal year, 90% reliable discharge data is called a dry year (Linsley et al., 1989). Each reliability level is analyzed for its level of success, then the percentage is correlated with the area that can be served. With each reliability and each level of success, a Rule Curve is created and the irrigation area that can be served is based on the percentage of reliability that has been analyzed. The irrigation area that can be served is 1,185 ha, and the clean water service is 20 l/sec. From the simulation above, the results obtained are: In Wet Years Service Reliability is 100%, In a Normal Year Service Reliability is 100%, In dry years, service reliability is 88.90%.

**Table 3.** Reservoir simulation in a wet year

| Month | Period | Inflow | | Total Inflow | Cumulative inflow | Total outflow | Cumulative outflow | Spillout | Water level elevation | Catchment area | Information |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $m^3/s$ | $10^3$ $m^3$ | $10^3$ $m^3$ | $10^3$ $m^3$ | $10^3$ $m^3$ | $10^3$ $m^3$ | $10^3$ $m^3$ | (m) | $10^3$ ($m^2$) | |
| 1 | I | 8.23 | 7,110.83 | 7,112.94 | 7,112.94 | 787.79 | 787.79 | 6,269.05 | 198.997 | 174.363 | Success |
| | II | 7.56 | 6,535.60 | 6,537.28 | 6,537.28 | 962.94 | 962.94 | 5,518.24 | 198.997 | 174.363 | Success |
| | III | 6.36 | 6,043.64 | 6,045.32 | 6,045.32 | 1,127.39 | 1,127.39 | 4,861.83 | 198.997 | 174.363 | Success |
| 2 | I | 6.81 | 5,882.61 | 5,884.43 | 5,884.43 | 721.56 | 721.56 | 5,106.77 | 198.997 | 174.363 | Success |
| | II | 6.84 | 5,908.53 | 5,910.11 | 5,910.11 | 950.51 | 950.51 | 4,903.49 | 198.997 | 174.363 | Success |
| | III | 7.14 | 4,932.51 | 4,933.86 | 4,933.86 | 873.81 | 873.81 | 4,003.95 | 198.997 | 174.363 | Success |
| 3 | I | 5.37 | 4,637.54 | 4,638.94 | 4,638.94 | 1,100.18 | 1,100.18 | 3,482.66 | 198.997 | 174.363 | Success |
| | II | 5.39 | 4,659.83 | 4,661.01 | 4,661.01 | 1,720.34 | 1,720.34 | 2,884.58 | 198.997 | 174.363 | Success |
| | III | 4.35 | 4,137.84 | 4,138.85 | 4,138.85 | 2,117.37 | 2,117.37 | 1,965.38 | 198.997 | 174.363 | Success |
| 4 | I | 5.19 | 4,483.61 | 4,484.71 | 4,484.71 | 1,718.50 | 1,718.50 | 2,710.12 | 198.997 | 174.363 | Success |
| | II | 5.51 | 4,756.84 | 4,757.93 | 4,757.93 | 1,790.82 | 1,790.82 | 2,911.01 | 198.997 | 174.363 | Success |
| | III | 4.52 | 3,905.40 | 3,906.16 | 3,906.16 | 1,764.08 | 1,764.08 | 2,085.97 | 198.997 | 174.363 | Success |
| 5 | I | 4.33 | 3,737.18 | 3,737.86 | 3,737.86 | 1,505.97 | 1,505.97 | 2,175.79 | 198.997 | 174.363 | Success |
| | II | 4.23 | 3,656.73 | 3,657.19 | 3,657.19 | 1,645.22 | 1,645.22 | 1,955.87 | 198.997 | 174.363 | Success |
| | III | 3.35 | 3,186.12 | 3,186.85 | 3,186.85 | 1,736.22 | 1,736.22 | 1,394.54 | 198.997 | 174.363 | Success |
| 6 | I | 2.54 | 2,191.34 | 2,191.67 | 2,191.67 | 1,553.95 | 1,553.95 | 581.62 | 198.997 | 174.363 | Success |
| | II | 2.96 | 2,560.93 | 2,561.09 | 2,561.09 | 1,406.06 | 1,406.06 | 1,098.93 | 198.997 | 174.363 | Success |
| | III | 2.57 | 2,221.44 | 2,221.63 | 2,221.63 | 1,235.18 | 1,235.18 | 930.34 | 198.997 | 174.363 | Success |
| 7 | I | 2.13 | 1,839.70 | 1,839.79 | 1,839.79 | 1,029.62 | 1,029.62 | 754.07 | 198.997 | 174.363 | Success |
| | II | 2.07 | 1,785.99 | 1,786.41 | 1,786.41 | 586.01 | 586.01 | 1,144.29 | 198.997 | 174.363 | Success |
| | III | 1.83 | 1,735.86 | 1,735.94 | 1,735.94 | 309.60 | 309.60 | 1,370.24 | 198.997 | 174.363 | Success |
| 8 | I | 1.6 | 1,380.43 | 1,380.50 | 1,380.50 | 294.11 | 294.11 | 1,030.28 | 198.997 | 174.363 | Success |
| | II | 1.47 | 1,271.67 | 1,271.73 | 1,271.73 | 352.59 | 352.59 | 863.05 | 198.997 | 174.363 | Success |
| | III | 1.37 | 1,305.88 | 1,305.92 | 1,305.92 | 444.77 | 444.77 | 805.04 | 198.997 | 174.363 | Success |
| 9 | I | 1.35 | 1,168.51 | 1,168.65 | 1,168.65 | 482.44 | 482.44 | 630.11 | 198.997 | 174.363 | Success |
| | II | 1.35 | 1,162.97 | 1,163.00 | 1,163.00 | 657.66 | 657.66 | 449.24 | 198.997 | 174.363 | Success |
| | III | 1.28 | 1,104.01 | 1,104.12 | 1,104.12 | 838.38 | 838.38 | 209.64 | 198.997 | 174.363 | Success |
| 10 | I | 1.74 | 1,505.89 | 1,506.62 | 1,506.62 | 814.33 | 814.33 | 636.19 | 198.997 | 174.363 | Success |
| | II | 1.91 | 1,646.94 | 1,647.55 | 1,647.55 | 797.86 | 797.86 | 793.6 | 198.997 | 174.363 | Success |
| | III | 2.2 | 2,089.72 | 2,090.61 | 2,090.61 | 629.90 | 629.90 | 1,404.61 | 198.997 | 174.363 | Success |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | I | 3.04 | 2,626.64 | 2,627.84 | 2,627.84 | 391.35 | 391.35 | 2,180.39 | 198.997 | 174.363 | Success |
| | II | 4.77 | 4,121.67 | 4,123.51 | 4,123.51 | 687.89 | 687.89 | 3,379.52 | 198.997 | 174.363 | Success |
| | III | 5.17 | 4,470.75 | 4,471.99 | 4,471.99 | 1,419.80 | 1,419.80 | 2,996.09 | 198.997 | 174.363 | Success |
| 12 | I | 7.77 | 6,717.36 | 6,719.00 | 6,719.00 | 1,121.88 | 1,121.88 | 5,541.02 | 198.997 | 174.363 | Success |
| | II | 6.76 | 5,841.14 | 5,842.81 | 5,842.81 | 1,125.89 | 1,125.89 | 4,660.81 | 198.997 | 174.363 | Success |
| | III | 7.79 | 7,400.00 | 7,401.49 | 7,401.49 | 629.31 | 629.31 | 6,716.08 | 199.000 | 174.360 | Success |

**Table 4.** Reservoir simulation in a normal year

| Mo nth | Peri od | Inflow | | Total Inflow | Cumulative inflow | Total outflow | Cumulat ive outflow | Spillout | Water level elevation | Catchme nt area | Informati on |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | m³/dt | 10³ m³ | 10³ m³ | 10³ m³ | 10³ m³ | 10³ m³ | 10³ m³ | (m) | 10³ (m²) | |
| 1 | I | 4.44 | 3,832.17 | 3,833.08 | 3,833.08 | 713.31 | 713.31 | 3,063.67 | 198.997 | 174.36 | Success |
| | II | 5.72 | 4,937.95 | 4,938.88 | 4,938.88 | 888.46 | 888.46 | 3,994.33 | 198.997 | 174.36 | Success |
| | III | 3.63 | 3,446.72 | 3,447.66 | 3,447.66 | 1,045.46 | 1,045.46 | 2,346.10 | 198.997 | 174.36 | Success |
| 2 | I | 4.17 | 3,602.10 | 3,603.03 | 3,603.03 | 647.09 | 647.09 | 2,899.85 | 198.997 | 174.36 | Success |
| | II | 3.53 | 3,052.79 | 3,053.67 | 3,053.67 | 876.04 | 876.04 | 2,121.54 | 198.997 | 174.36 | Success |
| | III | 4.75 | 3,280.34 | 3,280.97 | 3,280.97 | 814.23 | 814.23 | 2,410.64 | 198.997 | 174.36 | Success |
| 3 | I | 3.26 | 2,818.39 | 2,819.11 | 2,819.11 | 1,025.70 | 1,025.70 | 1,737.31 | 198.997 | 174.36 | Success |
| | II | 3.45 | 2,977.43 | 2,977.97 | 2,977.97 | 1,645.86 | 1,645.86 | 1,276.01 | 198.997 | 174.36 | Success |
| | III | 3.21 | 3,051.63 | 3,052.09 | 3,052.09 | 2,035.44 | 2,035.44 | 960.55 | 198.997 | 174.36 | Success |
| 4 | I | 3.29 | 2,840.33 | 2,840.99 | 2,840.99 | 1,644.02 | 1,644.02 | 1,140.88 | 198.997 | 174.36 | Success |
| | II | 3.44 | 2,971.91 | 2,972.24 | 2,972.24 | 1,716.34 | 1,716.34 | 1,199.80 | 198.997 | 174.36 | Success |
| | III | 2.8 | 2,423.11 | 2,423.19 | 2,423.19 | 1,689.61 | 1,689.61 | 677.48 | 198.997 | 174.36 | Success |
| 5 | I | 2.4 | 2,071.31 | 2,071.45 | 2,071.45 | 1,431.49 | 1,431.49 | 583.86 | 198.997 | 174.36 | Success |
| | II | 1.91 | 1,650.12 | 1,650.16 | 1,650.16 | 1,570.74 | 1,570.74 | 23.32 | 198.997 | 174.36 | Success |
| | III | 2.35 | 2,237.19 | 2,237.34 | 2,237.34 | 1,654.29 | 1,654.29 | 526.95 | 198.997 | 174.36 | Success |
| 6 | I | 1.67 | 1,446.27 | 1,446.34 | 1,446.34 | 1,479.47 | 1,479.47 | - | 198.800 | 171.21 | Success |
| | II | 1.59 | 1,371.38 | 1,371.38 | 1,371.38 | 1,331.47 | 1,331.47 | - | 198.997 | 174.36 | Success |
| | III | 1.46 | 1,258.31 | 1,258.32 | 1,258.32 | 1,160.71 | 1,160.71 | 41.52 | 198.997 | 174.36 | Success |
| 7 | I | 1.38 | 1,191.44 | 1,191.44 | 1,191.44 | 955.14 | 955.14 | 180.2 | 198.997 | 174.36 | Success |
| | II | 1.37 | 1,185.55 | 1,185.62 | 1,185.62 | 511.54 | 511.54 | 617.98 | 198.997 | 174.36 | Success |
| | III | 1.08 | 1,029.75 | 1,029.76 | 1,029.76 | 227.68 | 227.68 | 745.98 | 198.997 | 174.36 | Success |
| 8 | I | 0.97 | 839.28 | 839.29 | 839.29 | 219.63 | 219.63 | 563.55 | 198.997 | 174.36 | Success |
| | II | 0.83 | 716.46 | 716.46 | 716.46 | 278.11 | 278.11 | 382.25 | 198.997 | 174.36 | Success |
| | III | 0.85 | 808.89 | 808.89 | 808.89 | 362.85 | 362.85 | 389.94 | 198.997 | 174.36 | Success |
| 9 | I | 0.7 | 606.34 | 606.36 | 606.36 | 407.96 | 407.96 | 142.3 | 198.997 | 174.36 | Success |
| | II | 0.67 | 582.13 | 582.13 | 582.13 | 583.18 | 583.18 | - | 198.991 | 174.27 | Success |
| | III | 0.69 | 594.02 | 594.02 | 594.02 | 763.90 | 763.90 | - | 197.965 | 156.95 | Success |
| 10 | I | 0.91 | 786.42 | 786.53 | 786.53 | 739.10 | 739.10 | - | 198.256 | 162.37 | Success |
| | II | 0.75 | 651.52 | 651.59 | 651.59 | 722.80 | 722.80 | - | 197.795 | 150.86 | Success |
| | III | 1.24 | 1,181.94 | 1,182.05 | 1,182.05 | 546.78 | 546.78 | 384.46 | 198.997 | 174.36 | Success |
| 11 | I | 0.87 | 747.99 | 748.41 | 748.41 | 316.87 | 316.87 | 375.44 | 198.997 | 174.36 | Success |
| | II | 2.14 | 1,848.49 | 1,849.14 | 1,849.14 | 613.41 | 613.41 | 1,179.63 | 198.997 | 174.36 | Success |
| | III | 2.21 | 1,910.78 | 1,911.49 | 1,911.49 | 1,345.32 | 1,345.32 | 510.08 | 198.997 | 174.36 | Success |
| 12 | I | 3.58 | 3,094.64 | 3,095.84 | 3,095.84 | 1,047.40 | 1,047.40 | 1,992.33 | 198.997 | 174.36 | Success |
| | II | 4.08 | 3,525.20 | 3,526.01 | 3,526.01 | 1,051.42 | 1,051.42 | 2,418.50 | 198.997 | 174.36 | Success |
| | III | 5.39 | 5,122.60 | 5,123.57 | 5,123.57 | 547.39 | 547.39 | 4,520.09 | 198.997 | 174.36 | Success |

**Table 5.** Reservoir simulation in a dry year

| Month | Period | Inflow | | Total Inflow | Cumulative inflow | Total outflow | Cumulative outflow | Spillout | Water level elevation | Catchment area | Information |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | m³/dt | 10³ m³ | 10³ m³ | 10³ m³ | 10³ m³ | 10³ m³ | 10³ m³ | (m) | 10³ (m²) | |
| 1 | I | 1.97 | 1,699.02 | 1,699.93 | 3,833.08 | 678.72 | 678.72 | 965.11 | 198.997 | 174.36 | Success |
| | II | 3.16 | 2,728.28 | 2,729.21 | 4,938.88 | 853.87 | 853.87 | 1,819.24 | 198.997 | 174.36 | Success |
| | III | 3.05 | 2,902.20 | 2,903.14 | 3,447.66 | 1,007.41 | 1,007.41 | 1,839.62 | 198.997 | 174.36 | Success |
| 2 | I | 2.77 | 2,392.10 | 2,393.03 | 3,603.03 | 612.50 | 612.5 | 1,724.43 | 198.997 | 174.36 | Success |
| | II | 2.71 | 2,339.57 | 2,340.45 | 3,053.67 | 841.45 | 841.45 | 1,442.90 | 198.997 | 174.36 | Success |
| | III | 2.87 | 1,980.82 | 1,981.45 | 3,280.97 | 786.56 | 786.56 | 1,138.80 | 198.997 | 174.36 | Success |
| 3 | I | 2.31 | 1,994.08 | 1,994.81 | 2,819.11 | 991.11 | 991.11 | 947.59 | 198.997 | 174.36 | Success |
| | II | 2.16 | 1,867.94 | 1,868.48 | 2,977.97 | 1,611.27 | 1,611.27 | 201.11 | 198.997 | 174.36 | Success |
| | III | 2.12 | 2,011.48 | 2,011.95 | 3,052.09 | 1,997.40 | 1,997.40 | - | 198.997 | 174.36 | Success |
| 4 | I | 2.99 | 2,585.31 | 2,585.98 | 2,840.99 | 1,609.43 | 1,609.43 | 920.45 | 198.997 | 174.36 | Success |
| | II | 2.27 | 1,964.72 | 1,965.05 | 2,972.24 | 1,681.75 | 1,681.75 | 227.19 | 198.997 | 174.36 | Success |
| | III | 2.16 | 1,862.18 | 1,862.26 | 2,423.19 | 1,655.02 | 1,655.02 | 151.15 | 198.997 | 174.36 | Success |
| 5 | I | 1.66 | 1,430.25 | 1,430.39 | 2,071.45 | 1,396.90 | 1,396.90 | - | 198.997 | 174.36 | Success |
| | II | 1.26 | 1,090.51 | 1,090.54 | 1,650.16 | 1,536.15 | 1,536.15 | - | 195.616 | 85.97 | Success |
| | III | 1.8 | 1,708.43 | 1,708.50 | 2,237.34 | 1,612.88 | 1,612.88 | - | 196.589 | 109.72 | Success |
| 6 | I | 1.1 | 949.32 | 949.36 | 1,446.34 | 1,442.61 | 1,442.61 | - | 190.700 | 24.61 | Failed |
| | II | 1.11 | 957.37 | 957.37 | 1,371.38 | 1,291.99 | 1,291.99 | - | 190.700 | 24.61 | Failed |
| | III | 1.09 | 937.73 | 937.74 | 1,258.32 | 1,121.53 | 1,121.53 | - | 190.700 | 24.61 | Failed |
| 7 | I | 1.05 | 904.51 | 904.51 | 1,191.44 | 915.38 | 915.38 | - | 190.700 | 24.61 | Failed |
| | II | 0.92 | 793.1 | 793.11 | 1,185.62 | 472.05 | 472.05 | - | 196.385 | 103.42 | Success |
| | III | 0.84 | 801.8 | 801.8 | 1,029.76 | 186.89 | 186.89 | 186.97 | 198.997 | 174.36 | Success |
| 8 | I | 0.74 | 640.97 | 640.98 | 839.29 | 185.04 | 185.04 | 399.83 | 198.997 | 174.36 | Success |
| | II | 0.68 | 585.59 | 585.59 | 716.46 | 243.52 | 243.52 | 285.97 | 198.997 | 174.36 | Success |
| | III | 0.65 | 617.64 | 617.64 | 808.89 | 324.8 | 324.80 | 236.74 | 198.997 | 174.36 | Success |
| 9 | I | 0.58 | 499.02 | 499.04 | 606.36 | 373.37 | 373.37 | 69.57 | 198.997 | 174.36 | Success |
| | II | 0.53 | 461.99 | 461.99 | 582.13 | 548.59 | 548.59 | - | 198.478 | 165.98 | Success |
| | III | 0.49 | 427.61 | 427.61 | 594.02 | 728.94 | 728.94 | - | 196.234 | 98.79 | Success |
| 10 | I | 0.48 | 415.11 | 415.18 | 786.53 | 702.01 | 702.01 | - | 191.366 | 29.53 | Success |
| | II | 0.44 | 381.39 | 381.4 | 651.59 | 681.86 | 681.86 | - | 190.700 | 24.61 | Failed |
| | III | 0.4 | 384.1 | 384.12 | 1,182.05 | 502.32 | 502.32 | - | 190.700 | 24.61 | Failed |
| 11 | I | 0.52 | 445.43 | 445.49 | 748.41 | 275.86 | 275.86 | - | 194.623 | 70.03 | Success |
| | II | 1.02 | 885.41 | 885.68 | 1,849.14 | 574.29 | 574.29 | - | 197.672 | 146.47 | Success |
| | III | 1.39 | 1,198.48 | 1,199.08 | 1,911.49 | 1,309.56 | 1,309.56 | - | 196.847 | 117.68 | Success |
| 12 | I | 3.04 | 2,623.05 | 2,623.86 | 3,095.84 | 1,010.42 | 1,010.42 | 1,234.98 | 198.997 | 174.36 | Success |
| | II | 2.43 | 2,099.25 | 2,100.07 | 3,526.01 | 1,016.83 | 1,016.83 | 1,027.14 | 198.997 | 174.36 | Success |
| | III | 3.22 | 3,056.81 | 3,057.79 | 5,123.57 | 509.34 | 509.34 | 2,492.35 | 198.997 | 174.36 | Success |

# 4 Conclusion

The irrigation area that can be irrigated by the Telaga Tunjung Dam is 1,185 ha, which includes Subak Meliling 300 ha, Subak Gadungan 476 ha, Subak Sungsang 409 ha. There is still an irrigation area that cannot be served by the Telaga Tunjung dam, amounting to 97 ha from the plan of 1,282 ha, this is addressed by optimizing water management in water deficit areas, and the clean water service is currently 20 l/sec. The simulation results for the Telaga Tunjung Dam are, In Wet Years Service Relia-bility is 100%, In a Normal Year Service Reliability is 100%, In dry years, service reliability is 88.90%

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