

INTISARI

Pembangunan Waduk Tukul dengan bendungan di Sungai Kali Telu yang berlokasi di Desa Karanggede, Kecamatan Arjosari, Kabupaten Pacitan direncanakan memiliki manfaat untuk penyediaan air baku, penyediaan air irigasi dan pembangkit listrik tenaga mikrohidro. Untuk menghasilkan pemanfaatan air waduk yang optimal, diperlukan kajian ilmiah tentang operasi waduk yang berorientasi multi kriteria. Pada penelitian ini dilakukan analisis ketersediaan air menggunakan model alihragam hujan aliran metode *Mock*, kebutuhan air irigasi dan kebutuhan air baku menggunakan dua kondisi, kondisi satu menggunakan debit maksimum pipa air baku 300 liter/detik dan kondisi dua menggunakan proyeksi kebutuhan air penduduk pada tahun 2040. Selanjutnya dilakukan simulasi pengaturan *release* air waduk berbasis neraca air menggunakan metode *Standard Operating Rule* (SOR) dan dilakukan optimasi menggunakan metode Program Linier. Kriteria pemanfaatan air optimal didasarkan pada intensitas tanam, faktor k , reliabilitas layanan air irigasi dan air baku. Setelah dilakukan simulasi dan optimasi pemanfaatan air Waduk Tukul menggunakan data debit Sungai Kali Telu historis menghasilkan intensitas tanam sebesar 213,57%, reliabilitas air irigasi dan air baku mencapai 99,90% dan 96,32% dan rerata faktor k irigasi dan air baku masing-masing sebesar 0,99 dan 0,97 pada kondisi satu, sedangkan kondisi dua, intensitas tanam mencapai 226,14% dengan reliabilitas air irigasi dan air baku mencapai 99,90% dan 98,64%, dan rerata faktor k irigasi dan air baku masing-masing sebesar 1,00 dan 0,99. Untuk skenario debit tahun basah, intensitas tanam dapat mencapai 300% pada kedua kondisi. Pada skenario debit tahun normal, intensitas tanam 283,15% (kondisi satu) dan 299,05% (kondisi dua), sedangkan skenario debit tahun kering, intensitas tanam pada kondisi tanam satu dan dua mencapai 254,01% dan 268,32%. Pada skenario debit basah, normal dan kering, semua layanan air dapat dipenuhi dengan reliabilitas 100%, nilai minimum faktor k air irigasi dan air baku mampu mencapai nilai minimum 0,75 dan 0,85.

Kata Kunci: Optimasi, neraca air, multi kriteria, reliabilitas.

ABSTRACT

Tukul Reservoir which located in Karanggede, Pacitan Regency is constructed to have some purposes, i.e. domestic water supply, irrigation water supply, and micro-hydro power plant intake. For obtaining the optimal result of its purposes, scientific study is needed, especially multi criteria study. In this study, an analysis of water availability was carried out using the Mock method rainfall-runoff transform model, irrigation water requirements, and domestic water requirements, there are two conditions of domestic water demand. The first condition using a maximum discharge of 300 liters/second of domestic water intake and the second condition using projected population water needs in 2040. Further, the simulation of water reservoir based on water balance is conducted using the Standard Operating Rule (SOR) method and optimization is carried out using the Linear Program method. The optimal water utilization criteria are based on cropping intensity, k -factor, as well as the reliability of irrigation water and domestic water services. After simulating and optimizing water utilization of Tukul Reservoir using historical discharge data of Kali Telu, cropping intensity reached 213.57%, the reliability of irrigation and domestic water reached 99.90% and 96.32% with the average k factors of irrigation and domestic water 0.99 and 0.97 for the first condition, meanwhile, for the second condition, cropping intensity reached 226.14% with the reliability of irrigation and domestic water reach 99.90% and 98.64%, and the average k factors of irrigation and domestic water respectively 1.00 and 0.99. For the wet climate year discharge scenario, cropping intensity could reach 300% in both conditions. In the normal climate year discharge scenario, cropping intensity reached 283.15% (first condition) and 299.05% (second condition), while during the dry climate year discharge scenario, cropping intensity for both conditions reached 254.01% and 268.32%. In the wet, normal and dry climate year discharge scenarios, all water services could be fulfilled up to 100% reliability, the minimum value of the k factor irrigation and domestic water can reach a minimum of 0.75 and 0.85.

Keywords: optimization, water balance, multi-criteria, reliability.