



INTISARI

Waduk Bener dibangun di Desa Guntur, Kabupaten Purworejo, Jawa Tengah direncanakan memiliki beberapa manfaat yaitu penyediaan air baku, penyediaan air irigasi, dan pembangkit listrik tenaga mikrohidro. Sumber air Waduk Bener berasal dari aliran Sungai Bogowonto dengan luas daerah tangkapan air sebesar 114,3 km². Kebijakan pengoperasian waduk sangat penting untuk memaksimalkan kinerja pemanfaatan air waduk guna memenuhi kebutuhan air. Penelitian ini bertujuan untuk menentukan *release* air yang optimal dengan mempertimbangkan prioritas kebutuhan air dan lima alternatif jadwal tanam. Model optimasi pengaturan *release* waduk menggunakan metode Program Linier berbasis prinsip neraca air metode *Standard Operating Rule* (SOR) dikembangkan untuk mendapatkan *release* air yang optimal. Ketersediaan air dihitung berdasarkan pencatatan debit harian di Bendung Penungkulan yang terletak sekitar 5 km di hilir Bendungan Bener. Kebutuhan air irigasi dihitung berdasarkan KP-01 dengan mempertimbangkan besaran *inflow* lateral. Kebutuhan air baku yang digunakan adalah 1,5 m³/detik. Evaluasi kinerja pemanfaatan air optimal dilakukan dengan indikator kinerja intensitas tanam, faktor pemenuhan kebutuhan air: *k* dan reliabilitas layanan air baku serta air irigasi berdasarkan lima alternatif jadwal tanam. Setiap alternatif jadwal tanam mundur setengah bulan dimulai dari September minggu ketiga. Hasil simulasi pengaturan *release* air waduk dengan *inflow* data debit historis, menunjukkan intensitas tanam tahunan tidak dapat mencapai 300% untuk semua alternatif jadwal tanam. Nilai faktor *k* air baku dan irigasi semua alternatif jadwal tanam memenuhi persyaratan yang ditetapkan, sehingga reliabilitas semua layanan air mencapai 100%. Hasil optimasi pemanfaat air waduk menggunakan Excel Solver dengan *inflow* kondisi tahun basah, normal dan kering, menunjukkan intensitas tanam tahunan dapat mencapai 300% pada alternatif jadwal tanam pertama, kedua dan ketiga. *Release* air baku dan air irigasi mampu memenuhi faktor *k* minimum yaitu 0,85 dan 0,80 sehingga reliabilitas semua layanan air mencapai 100%. Jadwal tanam terbaik adalah alternatif pertama dan kedua yang menghasilkan intensitas tanam dan faktor *k* paling tinggi. Penerapan model optimasi metode program linier dapat memaksimalkan kinerja pemanfaatan air Waduk Bener yang ditunjukkan dengan terpenuhinya batasan nilai faktor *k*, intensitas tanam tahunan dan reliabilitas pemenuhan kebutuhan air baku dan irigasi.

Kata kunci: Optimasi, intensitas tanam, jadwal tanam, reliabilitas.

ABSTRACT

Bener Reservoir was built in Guntur Village, Purworejo Regency, Central Java Province. It was designed for many purposes, such as domestic water supply, irrigation water supply, and micro-hydro-electric power generation. The water source of Bener Reservoir originates from the Bogowonto River, with a catchment area of 114.3 km². Reservoir operating rule is essential to maximize the performance of reservoir water utilization to meet water needs. This study aims to determine the optimal water release based on considering water needs and five alternative cropping schedules. The optimization model for reservoir water release using the Linear Programming method based on the water balance principle of the Standard Operating Rule (SOR) was developed to obtain optimal water release. The water availability was calculated based on the daily discharge observed at Penungkulan Weir, located approximately 5 km downstream of the Bener Reservoir. Irrigation water needs were calculated based on KP-01 Design Criteria of Irrigation Design Standards by considering the amount of lateral inflow from tributaries. The domestic water requirement used was 1.5 m³/second. Evaluation of optimal water utilization performance was carried out with several indicators: cropping intensity, water needs fulfillment (*k*), reliability of domestic water services, and irrigation water based on five alternative cropping schedules. Each alternative of cropping schedule starts two weeks later than the previous one, beginning from the third week of September. The reservoir water release simulation using historical inflow discharge indicated that the annual cropping intensity could not reach 300% for all alternative cropping schedules. The *k* factor of domestic water and irrigation water for all alternative cropping schedules satisfied the requirements; hence the reliability of all water services reaches 100%. Optimizing reservoir water utilization using Excel Solver with the inflow of wet, normal, and dry year conditions showed that the annual cropping intensity might reach 300% for the first, second, and third alternative cropping schedules. The optimal release for domestic water and irrigation water was able to meet the minimum *k* factors of 0.85 and 0.80, respectively; therefore, the reliability of all water services reaches 100%. The most optimum cropping schedules are the first and second alternatives, which produce the highest cropping intensity and *k* factor. Implementing the Linear Programming Method may optimize the performance of Bener Reservoir water utilization, indicated by the fulfillment of the *k* factor, the annual cropping intensity, and the reliability of meeting all water needs.

Keywords: Optimization, cropping intensity, cropping schedule, reliability.