

UJI PERFORMANCE MODEL INFILTRASI HORTON, PHILLIP, DAN KOSTIAKOV UNTUK PREDIKSI LIMPASAN PERMUKAAN DI DEMPLOT AGROFORESTY DAN PERTANIAN INTENSIF DI SUB DAS MERAWU

INTISARI

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Tujuan dari penelitian ini adalah: i) membandingkan model Horton, Philips dan Kostiakov untuk menghitung laju infiltrasi tanah pada demplot agroforestri dan pertanian, ii) menganalisa model infiltrasi terbaik untuk menghitung laju infiltrasi tanah pada demplot agroforestri dan pertanian, iii) memprediksi limpasan permukaan dengan metode SCS-CN yang didasarkan pada laju infiltrasi dari model terpilih. Lokasi penelitian terletak di demplot agroforestri dan pertanian intensif yang berada di wilayah Sub DAS Merawu pada bulan Maret 2018. Tiga model empiris infiltrasi yaitu Horton, Phillip, dan Kostiakov yang digunakan untuk mengukur laju infiltrasi model dan pengukuran laju di lapangan. Pengukuran laju infiltrasi di lapangan dilakukan dengan metode *double-ring infiltrometer*. Pada setiap demplot dipilih 6 titik untuk pengukuran infiltrasi dan pengambilan sampel tanah. Keenam titik dipilih berdasarkan metode *purposive sampling* yang mewakili lereng atas, lereng tengah dan lereng bawah. Model infiltrasi ini divalidasi berdasarkan koefisien uji deterministik (R^2). Model infiltrasi dengan nilai R^2 tertinggi dipilih sebagai model terbaik dan selanjutnya digunakan sebagai prediksi limpasan permukaan dengan metode SCS-CN. Hasil penelitian menunjukkan nilai rerata laju infiltrasi model Horton, Phillip, dan Kostiakov secara berturut-turut yaitu 267,81 mm/jam, 334,85 mm/jam dan 343,29 mm/jam. Nilai R^2 pada ketiga model sebagai berikut: Horton = 0.547, Phillips = 0.674 dan Kostiakov = 0.679. Nilai R^2 terbesar yaitu model Kostiakov sehingga dipilih untuk menghitung nilai limpasan permukaan dengan menggunakan metode SCS-CN. Limpasan permukaan yang terjadi pada demplot pertanian intensif untuk bulan Februari 2018 sebesar 224 mm, Maret 2018 yaitu 23,28 mm, April 2018 sebesar 2,56 mm dan Mei 2018 sebesar 3,63 mm. Sedangkan untuk demplot agroforestri untuk bulan Februari hingga Mei 2018 berturut-turut yaitu 134,85 mm, 4,05 mm, 0,87 mm dan 16,53 mm.

Kata Kunci: Infiltrasi, Horton, Phillip, Kostiakov, Limpasan Permukaan, SCS-CN, Sub-DAS Merawu, agroforestry, pertanian intensif

PERFORMANCE TEST OF HORTON, PHILLIP, AND KOSTIAKOV INFILTRATION MODEL FOR SURFACE PREDICTION IN DEMPLOT AGROFORESTY AND INTENSIVE AGRICULTURE IN THE MERAWU SUB-WATERSHED

ABSTRACT

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The objectives of this study are: i) comparing the Horton, Philips and Kostiakov models to calculate the rate of soil infiltration in agroforestry and agriculture demonstration plots, ii) analyzing the best infiltration models to calculate the rate of soil infiltration in agroforestry and agriculture demonstration plots, iii) predicting surface runoff by method SCS-CN which is based on the infiltration rate of the selected model. The study location was located in the agroforestry demonstration plot and intensive agriculture in the Merawu Sub-watershed area in March 2018. Three empirical models of infiltration, Horton, Phillip, and Kostiakov were used to measure the rate of model infiltration and rate measurement in the field. The measurement of infiltration rate in the field was carried out by double-ring infiltrometer method. At each demonstration plot, 6 points were chosen for measuring infiltration and soil sampling. The six points are chosen based on purposive sampling method that represents the upper slopes, the middle slope and the lower slope. This infiltration model is validated based on the determinastic test coefficient (R^2). The infiltration model with the highest R^2 value was chosen as the best model and subsequently used as surface runoff prediction by SCS-CN method. The results showed the mean infiltration rate of Horton, Phillip, and Kostiakov models respectively 267.81 mm / hour, 334.85 mm / hour and 343.29 mm / hour. The value of R^2 in the three models is as follows: Horton = 0.547, Phillips = 0.674 and Kostiakov = 0.679. The largest R^2 value is the Kostiakov model so it is chosen to calculate the surface runoff value using the SCS-CN method. Surface runoff that occurred in intensive agricultural demonstration plots for February 2018 was 224 mm, March 2018 was 23.28 mm, April 2018 was 2.56 mm and May 2018 was 3.63 mm. Whereas for the agroforestry demonstration plot for February until May 2018 respectively 134.85 mm, 4.05 mm, 0.87 mm and 16.53 mm.

Keywords: Infiltration, Horton, Phillip, Kostiakov, Surface Runoff, SCS-CN, Merawu Sub-watershed, agroforestry, intensive agriculture