

Land use assessment of Jeneberang watershed using hydrology and water availability analysis

M I Putera^{1,2}, A Munir³, M Achmad³ and Suhardi³

¹Agricultural Science Doctoral Program, Hasanuddin University, Indonesia

²Faculty of Agriculture, Muhammadiyah University of Parepare, Indonesia

³Faculty of Agriculture, Hasanuddin University, Indonesia

E-mail: iqbalputera1@gmail.com

Abstract. Jeneberang watershed management plays an important role to the function of Bili-Bili Dam as a multipurpose dam in maintaining year-round water availability (quantity and distribution), agricultural irrigation, water supply for the local freshwater provider (PDAM), demand on drinking water, and hydroelectric power plants in Gowa, Takalar, and Makassar. The study tried to answer the emerging problem of how to predict the hydrological state and water availability in the Jeneberang watershed throughout the year. This study applied the SWAT (Soil and Water Assessment Tool) model, a distributed model connected to the Geographic Information System (GIS) developed by Jeff Arnold for the USDA ARS (US Department of Agriculture - Agriculture Research Service). The hydrological model would be applied to evaluate a scenario of the climate change effects on the hydrology state. Understanding the watershed hydrological response to the changes in physics (land use) and climate (rainfall and air temperature) is an important component of water resource planning and management (Vorosmarty et al., 2000). One of the performance indicators for the watershed water balance is river discharge fluctuation (Surahman, 2016). The river regime coefficient demonstrates fluctuation in river discharge, a number showing the ratio between maximum discharge (Q_{max}) and minimum discharge (Q_{min}). SWAT model analysis showed the highest discharge (Q_{max}) of 30,805 m³/sec and lowest discharge (Q_{min}) of 994 m³/sec. The analysis employed the data of 2006 and 2009, resulted in the Nash-Sutcliffe (NS) Efficiency values of 0.65 (satisfied) and R^2 of 0.88 that in line with a study of Yusuf (2010) at the Cirasea watershed (0.74) and Junaidi (2011) at the Cisadane watershed (0.70). This value indicates that the SWAT method can predict the hydrological state of watersheds in Indonesia, including the Jeneberang watershed.

1. Introduction

Watershed plays a significant role in the catchment area for water availability in an area, so that it requires the best management plan. Water availability is the required water for production processes and daily needs that are generally generated from rainfall, lake, ground, and river. Watershed management aims to optimize the benefits of soil, water, and vegetation in alleviating drought, flooding, preventing soil erosion, increasing agricultural production, and increasing water availability



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