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RESEARCH ARTICLE

Water Balance in Oil Palm Plantation with Ridge Terrace and *Nephrolepis biserrata* as Cover Crop

Mira Ariyanti[A]*, Sudirman Yahya[B], Kukuh Murtilaksono[C], Suwarto[B], Hasril H. Siregar[D]

[A] Department of Agronomy, Faculty of Agriculture, University of Padjadjaran. Jl. Raya Bandung-Sumedang km.21, Jatinangor, West Java, Indonesia
[B] Department of Agronomy and Horticulture, Faculty of Agriculture, Bogor Agricultural Institute, Bogor, West Java, Indonesia
[C] Department of Soil Sciences and Land Resources, Faculty of Agriculture, Bogor Agricultural Institute, Bogor, West Java, Indonesia
[D] Indonesian Oil Palm Research Institute, Medan, North Sumatera, Indonesia

*Corresponding author; email: mira.ariyanti@unpad.ac.id

Abstract

The existence of oil palm plantations as a possible cause of dryness of sorrounding areas in Indonesia is a critical issue. Therefore, information related to the effects of oil palm plantations on the surrounding environment in terms of soil water content (SWC) availability is needed. Soil and water conservation techniques in the form of ridge terracing and cover crops, such as *Nephrolepis biserrata*, can be expected to potentially improve soil water reserves, especially in the dry-season, by accumulating water in the rainy season. This study aimed to study the effects of *N. biserrata* as cover crop, together with the potential effects of ridge terraces, on the water balance in mature oil palm plantations. The research was conducted in mature oil palm plantations, Afdeling III block 375 (planted in 1996) and block 415 (planted in 2005), Rejosari Unit, PT Perkebunan Nusantara (PTPN) VII in Natar District, South Lampung Regency, Indonesia, from August 2014 to January 2015. The research was based on of setting up 15 m x 20 m experimental plots with the following treatments: (i) without ridge terraces and without *N. biserrata* (G_0T_0); (ii) without ridge terraces but with *N. biserrata* (G_0T_1); (iii) with ridge terraces but without *N. biserrata* (G_1T_0); (iv) with ridge terraces and with *N. biserrata* (G_1T_1). Hydrology parameter data were collected for each treatment plot; water balance was calculated using a water balance equation. The results showed that the use of the cover crop *N. biserrata* in combination with ridge terraces helped improve SWC reserves by approximately 71% and 12%, respectively. The use of *N. biserrata* as a cover crop reduced the rate of water loss by percolation and run-off, by approximately 36% and 80%, respectively, in an area where the annual rainfall is above 2,400 mm per year. The presence of *N. biserrata* shortened the period of SWC deficit by extending the period of a water surplus by 70 days when compared with ridge terracing alone (which reduced the period of SWC by 50 days).

Keywords: *Nephrolepis biserrata*, cover crops, ridge terrace, water balance

Introduction

Oil palm (*Elaeis guineensis* Jacq.) is one of plantation crops that is important as a source of foreign exchange for Indonesia. The main product of oil palm is oil, for which the production value of production needs to be further developed in the interest of the national economy of Indonesia. Data from the Direktorat Jenderal Perkebunan (2014) showed that CPO production in 2014 was 27.7 million tons from an area of approximately 10.9 million ha.

The increase in the production of oil palm has been the result of a combination of strategies, particularly the adoption of technology improvements in the field. Soil and water conservation techniques have been adopted in oil palm plantations to improve the carrying capacity of those two factors (soil and water), with resulting improvements in plant growth and development, that have, in turn, improved production. According to Murtilaksono (2007), soil and water conservation technique using siltpit could delay dryness 3.5 months rather than contour ridge which could delay only 2.5 months more than control.