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**ANALYSIS OF WATER BALANCE TO DETERMINE  
WATER REQUIREMENT OF PINEAPPLE (*Ananas  
comusus* L. MERR.) IN PINEAPPLE PLANTATION  
LAMPUNG, INDONESIA**PRIYO CAHYONO<sup>1+</sup>, NUNGKI KUSUMA ASTUTI<sup>1\*</sup>, and ALI RAHMAT<sup>2,3</sup><sup>1</sup>*Department of Reseach and Development, Great Giant Pineapple  
Company, Indonesia*<sup>2</sup>*United Graduate School of Agriculture Science, Gifu University, Japan*<sup>3</sup>*Department of Forestry Engineering, School of Life Sciences and  
Technology, Sumatera Institute of Technology, Indonesia***ABSTRACT**

Irrigation on pineapple plants is very important because it affects the growth and production, but the irrigation cost is very expensive. But before planning irrigation needs to estimate water requirement of the plant. This study is to estimate water requirement of pine plant using simple water balance based on 30-year climatologic data. The results show, 30-year data of climatology data can be used to estimating water requirement of the pineapple plant. Water requirement for small plant, medium plant and big plant are 164.6mm, 31.2mm, and 12.5mm respectively for June-October. The peak of deficit on water balance occur in August, which is pineapple plant need intensive irrigation.

**Keywords:** Water Balance, Water requirement, Rainfall, Pineapple Plantation, Indonesia, Climate

**1 INTRODUCTION**

Pineapple is most important economic plants in the tropical area It is grown mainly for fresh, canned fruits and juice, and it the only source of bromelain and enzyme used in pharmaceuticals (Pornsuriya et al. 2008). Pineapple apple is one of horticulture commodity from Indonesia which has high potential in international fruits trade. The other hand, irrigation on pineapple plants is very important because it affects the growth and production (Rahmat et al. 2013). Azevedo et al. (2007) Reported, evapotranspiration pineapple plant in vegetative phase reach 3.5mm/day and total water use in vegetative phase around 1421 mm for 270-330 day. The purpose of this study is to estimate water requirement for pineapple plant using water balance based on local meteorology station data.

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## 2 METHODS

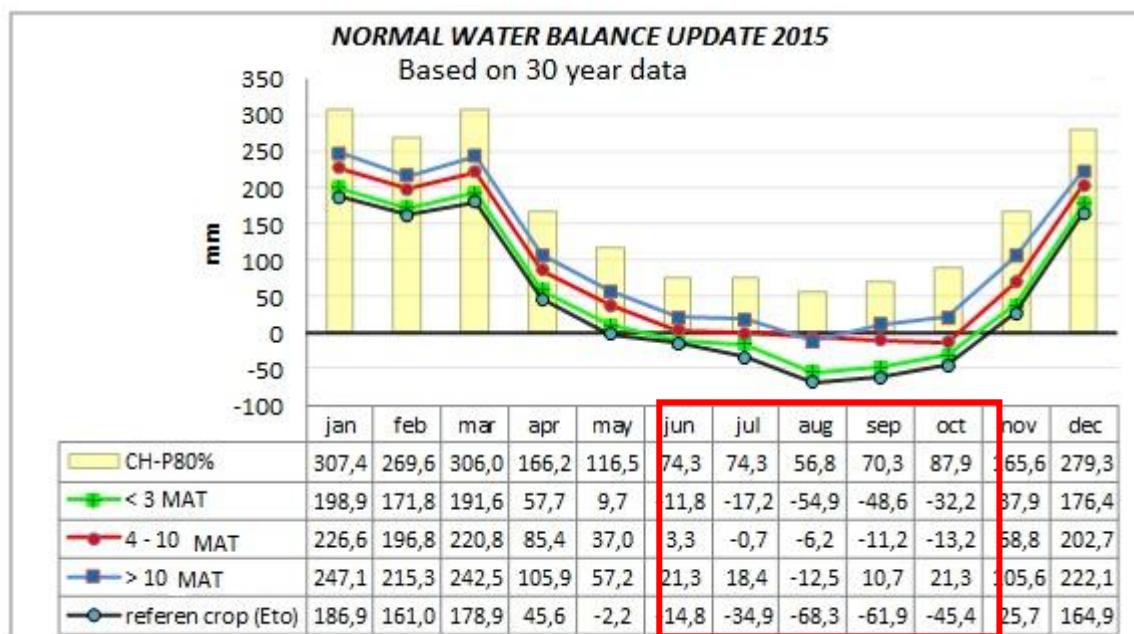
The experiment was conducted in Great Giant Pineapple plantation, Central Lampung, Indonesia. The climatology data was collected for 30 years from RnD meteorology station of Great Giant Pineapple Plantation.

Water requirement = 80%rainfall –Etc

80% rainfall is effective rainfall, Etc: evapotranspiration of plant

## 3 RESULTS AND DISCUSSION

Water balance shows the availability of water for a year with the calculation of the factors that affect water availability (input and output), for the months of water deficit and in a surplus of water.



**Figure 1. Monthly water balance of pineapple in different age of plant**

The results show climatological data can be use for estimating water requirement of pineapple plants. Different age/stage of pineapple plant give a different response on water balance. Indonesia is one of the countries that experience tropical monsoon climate. High air temperature and high solar radiation intensity in tropical countries case high evaporation as they strongly correlate each other (Feraris 1992; Rahmat et al. 2014). As tropical monsoon climate Indonesia has to season, dry season and rainy season. Based on results, in the rainy season from November, until May water balance for pineapple plant is surplus, this caused by water requirement of the plant was fulfilled by effective rainfall, and not need intensive irrigation in this period. But water balance getting deficit when entering dry season almost occur from June until October.

Pineapple plant 0-3 MAT (a month after transplanting) is the large deficit on water balance than other plants. Intensive irrigation is very needed for the small plant in June-October to support plant growth. August is a peak irrigation needed because in this month all stage of pineapple plant needs to irrigated.

Actually, the big plant will evaporate more water than small plant, but on this water balance big plant is lowest on deficit water balance. This caused by in small plant because the canopy si small and gap between plant is large many rainfalls will be a surface runoff or big canopy can reduce surface runoff and increase soil infiltration. Based on analysis water requirement for the small plant (0-3MTA) is 164.6 mm for June- October, medium plant (4-10 MTA) is 31.2 mm for june –October, and big plant (>10 MTA) is 12.5 mm for June-October.

#### **4 CONCLUSIONS**

30-year data of climatology data can be use to estimating water requirement of the pineapple plant. Water requirement for small plant, medium plant, and big plant are 164.6mm, 31.2mm, and 12.5mm respectively for June-October. The peak of deficit on water balance occur in August, which is pineapple plant need intensive irrigation.

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