

Evaluation of Evapotranspiration Value of Rice Paddies using MODIS Data and CROPWAT

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ABSTRACT:

Water Footprint (WFP) is a recently developed indicator to identify the usage and distribution of the fresh water resource. Among different types of WFPs, Green WFP is referred to total rainwater evapotranspiration (ET) plus the amount of water incorporating in a product. However, as the water incorporated into the crop is about 0.1~1% of the evapotranspiration volume, Green WFP is normally referred to as ET volume (Hoekstra et al., 2011). Together with irrigation water withdrawn from ground or surface water (i.e. Blue water), they are the main indicators of contribution of water usage introduced in agricultural products. Therefore in order to comprehensively understand the total amount of water used during crop growing stage, it is essential to identify the amount of Blue and Green water.

As rice is the main crop in Taiwan, we selected rice paddies located in the two towns in Taitung County in the eastern Taiwan as the testing site and focused on estimating the Green WFP in this paper. To this end, a remote sensing technique incorporating MODIS image data was applied to produce the map showing ET value distribution. However, due to the low spatial resolution of the MODIS data (1 km square per pixel), not only rice paddies were included in one pixel. As a result the computed ET value for each pixel was the value mixed from different land cover types. To distinguish the ET value of each land cover type, an ordinary least squares regression was performed and the ET value contributed from rice paddies could be estimated. In addition to the MODIS data, the CROPWAT software developed by FAO was also used to compute the ET value of the rice paddies over the testing area. Then the green WFP derived from the two methods were evaluated. The results are expected to quantify the visual water of the crop and for reference in water resource, agricultural management and land use planning.