UNIVERSITY OF THE PHILIPPINES

Master of Science in Environmental Science

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Developing an agricultural drought index in the Philippines using MODIS NDVI and LST data

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ABSTRACT

DEVELOPING AN AGRICULTURAL DROUGHT INDEX IN THE PHILIPPINES USING MODIS NDVI AND LST DATA

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Drought is a natural hazard characterized by below-normal precipitation, which can persist for months or even years. This recurrent extreme climate event can cause crop damage and yield loss, thereby inflicting negative socioeconomic impacts all over the world. As an agricultural country, the Philippines is highly susceptible to adverse impacts of drought events. Unfortunately, the country has no established method that can fully characterize agricultural drought. The Philippine Atmospheric, Geophysical and Astronomical Services Administration currently uses robust and reliable indices intended for detecting and monitoring meteorological drought. In this study, the primary objective is to develop a simple, accurate, cost-effective, and reliable satellite-derived localized drought index capable of detecting agricultural drought events in the Philippines within the recent Strong El Niño episode. Specifically, it aims to determine the accuracy of this index in detecting the occurrence of agricultural drought events, evaluate the performance of this remotely sensed agricultural drought index by comparing it with rainfall-based drought indices, and compare the trends of rice and corn crop yield anomalies with the proposed drought index. This paper also tries to demonstrate the implications of having an agricultural drought index on drought assessment, decision-making and management. Land products acquired from the Terra MODIS, such as Land Surface Temperature and Normalized Difference Vegetation

Index, were employed to devise a remotely sensed localized agricultural drought index called Standardized Vegetation and Temperature Ratio (SVTR). Monthly SVTR maps were produced from January 2015 to December 2016. The results showed that the SVTR has performed better than rainfall-based indices in terms of the detection of agricultural drought occurrence. This satellite-derived drought index has an overall accuracy of 78%, correctly identifying agricultural drought events 78% of the time, while missing 22% of actual agricultural drought conditions. Time-series analysis also showed that SVTR fairly follow the upward and downward trends of rice and corn yield anomalies from the first quarter of 2015 to fourth quarter of 2016. The pixel-wise nature of the agricultural drought index could help government agencies bolster drought decision-making, mitigation, and management by providing drought information from a provincial down to barangay level.