SPATIAL MODELLING OF WEATHER VARIABLES FOR PLANT DISEASE APPLICATIONS IN MWEA REGION

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Abstract
Climate change is expected to affect the agricultural systems, such as crop yield and plant disease occurrence and spread. To be able to mitigate against the negative impacts of climate change, there is a need to use early warning systems that account for expected changes in weather variables such as temperature and rainfall. Moreover, providing such information at high spatial and temporal resolutions can be useful in improving the accuracy of an early warning system. This paper describes a methodology that can be used to produce high spatial and temporal resolutions of minimum temperature, maximum temperature and rainfall in an agricultural area. We utilize MarkSim GCM, a weather file generator that incorporates IPCC based climate change models to downscale the weather variables at monthly intervals. An ensemble of 17 GCM models is used within the RCP 8.0 emission scenario within the latest model based CMIP5. We assessed the usability of the model, by comparing results produced to what has been recorded at weather station level over a vast region. Then, we estimate the correction factors for model results by implementing a linear regression that is used to assess the relationship between the variables and the deviation of model outputs to the weather station data. Finally, we use kriging geostatistical technique to interpolate the weather data, for the year 2010. Results indicated that the model overestimated the results of maximum temperature, while underestimating the result of minimum temperature. Variability in the recorded weather variables was also evident, indicating that the response variables such as plant disease severity dependent on such weather information could vary in the area. These datasets can be useful especially in predicting the occurrence of plant diseases, which are affected by either rainfall or temperature.

Key words: climate change, rice blast, temperature, rainfall, MarkSim GCM, disease scenario