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Estimation of Wheat Yield using Remotely Sensed and Modeled Data over Turkey

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Monitoring agricultural crop conditions during the growing season and estimating potential crop yields are important for evaluating seasonal production. The accurate and timely assessment of the losses in crop yields caused by a natural disaster, such as drought, may be critical for countries where their economies are reliant on their agricultural productivity. Early assessment of the reduction in crop yields can prevent a catastrophic situation and help meet the demands of strategic planning.

In this study, the Multiple Linear Regression model was used to estimate the wheat yields in Turkey. Remotely sensed-, model-, and in-situ-based measurements of affecting variables of crop productivity (i.e., precipitation, land surface temperature, soil moisture, wind, and Normalized Vegetation Difference Index) were extracted over selected areas in which yield data were available on them. The datasets are collected using different time scales (e.g., before/during sowing period, growing season, one/two months before harvest, etc.).

The cross-validation of more than 700 different model combinations over more than total 700 different administrative divisions (i.e., districts, provinces, and regions) showed that by using the best model selected for each district, on average, a correlation value of 0.65 and a mean absolute error of 35 kg/da can be obtained between estimated and observed yield values. While, this consistency is more pronounced over the districts located in the Central Anatolia region where the average production of the wheat in them is more than the rest of districts in the country. Overall, regional differences of the selected predictors of observed yield data, suggest that the land surface temperature can provide a useful exploratory and predictive tool for wheat yield estimation across the country.