# Forecasting County Level Crop Yield in Top Agricultural-Producing States Using Satellite Data

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Yield forecasting is critical for ensuring food security, especially given the rise of extreme weather events. However, the USDA NASS only provides state-level forecasts by conducting costly Objective Yield Surveys. This project proposed a simple yet effective method for forecasting the county-level yield of major crops in each state by utilizing remotely-sensed vegetation indices (VI) data. The vegetation indices were retrieved from the MODIS satellite on Google Earth Engine. Correlations were calculated between the final county-level crop yields and the monthly vegetation indices, with the highest correlation of 0.9177 occurring between the maximum VI of each growing season and county-level yield. Afterwards, a weighted regression was formulated to forecast the county-level crop yield by determining the coefficients between county-level vegetation indices and final yield along with the long term polynomial yield increase. The model is continuously retrained each year with new data, and uses the updated coefficients to forecast the crop yield of the next year. The model was used to predict the corn yield of every county in Illinois and Iowa between the years of 2013 - 2021, achieving a median absolute percent error of 6.03% and 5.9%, respectively, throughout the 8 years. The model also achieved a highly accurate state level yield prediction between 2013-2021, with an overall mean absolute percent error (MAPE) of 3.69% for Illinois, compared to the USDA NASS forecasts MAPE of 4.31%. This model accurately predicts both county and state level yields at no cost, allowing for accessible yield forecasts.

**Awards Won:**
Fourth Award of $500
Arizona State University: Arizona State University ISEF Scholarship (valued at up to $52,000 each)