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Evaluating high temporal and spatial resolution vegetation index for crop yield prediction

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Remote sensing data have been widely used in estimating crop yield. Remote sensing derived parameters such as Leaf Area Index (LAI), fraction of Absorbed Photosynthetically Active Radiation (fAPAR), and Vegetation Index (VI) were used either directly in building empirical models or by assimilating with crop growth models to predict crop yield. The abilities of remote sensing VI in crop yield modeling were evaluated at coarse spatial resolution and showed a great potential in capturing spatial and temporal variability of yield. With the increases of satellite remote sensing data and the emergences of new techniques, high temporal and spatial resolution data are now available or can be produced through data fusion techniques. This allows mapping crop condition, crop phenology and crop water use at the field scale. There is a potential to map crop yield at the field scale using high temporal and spatial resolution data. The goal of this study is to investigate the added values of high spatial and temporal VI for crop yield estimation. The study was conducted over a rain-fed agricultural area in central Iowa USA that covers 20 counties from 2001 to 2015. Initial results show that high temporal and spatial resolution data capture spatial variability of crop yield well and are highly correlated to crop yield. However, relationships vary from year to year, which implies VI cannot capture the inter-annual variability which may be affected by water availability, seeds improvement, and changes of management, etc. More environmental variables are needed for crop modeling. The recently available evapotranspiration (ET) and evaporative stress index (ESI) at the field scale provide necessary information to capture the inter-annual variability of crop yield and will be explored in the future.