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Unravelling the influence of on-farm management on US-North Central soybean yields

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Crop yield variability among fields is ubiquitous in all agricultural regions, including the US North Central (US NC) region. An efficient way to increase food production is by distributing yield variation among fields towards high yields. The objective of this study was to identify the management factors explaining field-to-field variation in soybean yield variation in the US NC region and identify interaction between management practices on yield. Field survey data, including yield and management information, were collected over two crop growing seasons (2014 and 2015) from rain fed and irrigated soybean fields in the US NC regions (total of 1423 field-year observations). Fields were grouped into technology extrapolation domains (TEDs) based on their site-specific soil and climate and conditional inference trees were used to discern management factors explaining yield variation within the same TED. In five of the nine TEDs, sowing date was the most important factor explaining yield variation and early-sown fields were associated with highest yields. Other explanatory factors for yield variation included maturity group, in-season foliar fungicide or insecticide application, tillage, and seeding rate. The maximum observed yield difference as quantified by management interactions, reached 28% among the highest and lowest yielding fields. These results indicate that stratified analysis of survey farmer data based on a soil-climate stratification and conditional inference trees can discern the influence of management factors (and their interactions) on soybean yield and identify opportunities for improving yield and input-use efficiencies.