Increasing genetic gain yield rate in soybean breeding

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Overview of project objectives

Increases in soybean yield through breeding have been slower than growers expect, with the rate of yield increases for soybean substantially less than that for corn. There are several possible targets for improving the rate of gain in soybean grain yield including increasing the selection intensity, measurement accuracy, genetic diversity and additive genetic variance, and decreasing the amount of time required for each breeding cycle. Through coordinated activities to be carried out across 12 breeding programs in the North Central region, the overall goal of the project is to increase the rate of genetic gain for soybean yield.

Key results

An introductory video about genetic gain was developed and delivered to the NCSRP. Several steps have been made in an effort to develop metrics to accurately estimate realized genetic gains. Syngenta delivered phenotypic data for lines grown in annual field trials for maturity groups II, III and IV for 2009–2017. Software has been written that will merge genotypic and phenotypic data from the Uniform Regional Trials. For the actual development of methods, a recent PNAS publication (Li et al, 2018) provides a novel method for removing the GxE contribution from the non-genetic (environmental) effects, thus leaving only genetic value and an indexed genotypic value for specific environments as a means to calculate realized genetic gains.

Benefit to farmers

Soybean breeders will be able to take advantage of the improved breeding methods that can be implemented in essentially any soybean breeding program. Diverse germplasm will be made available through selection methods. As a result, farmers will reap the benefits of higher yields from new cultivars.

Links

Increasing the rate of genetic gain for yield in soybean breeding programs *USB National Soybean Checkoff Research Database*