Science Societies

Improving estimated optimum fertilizer rates

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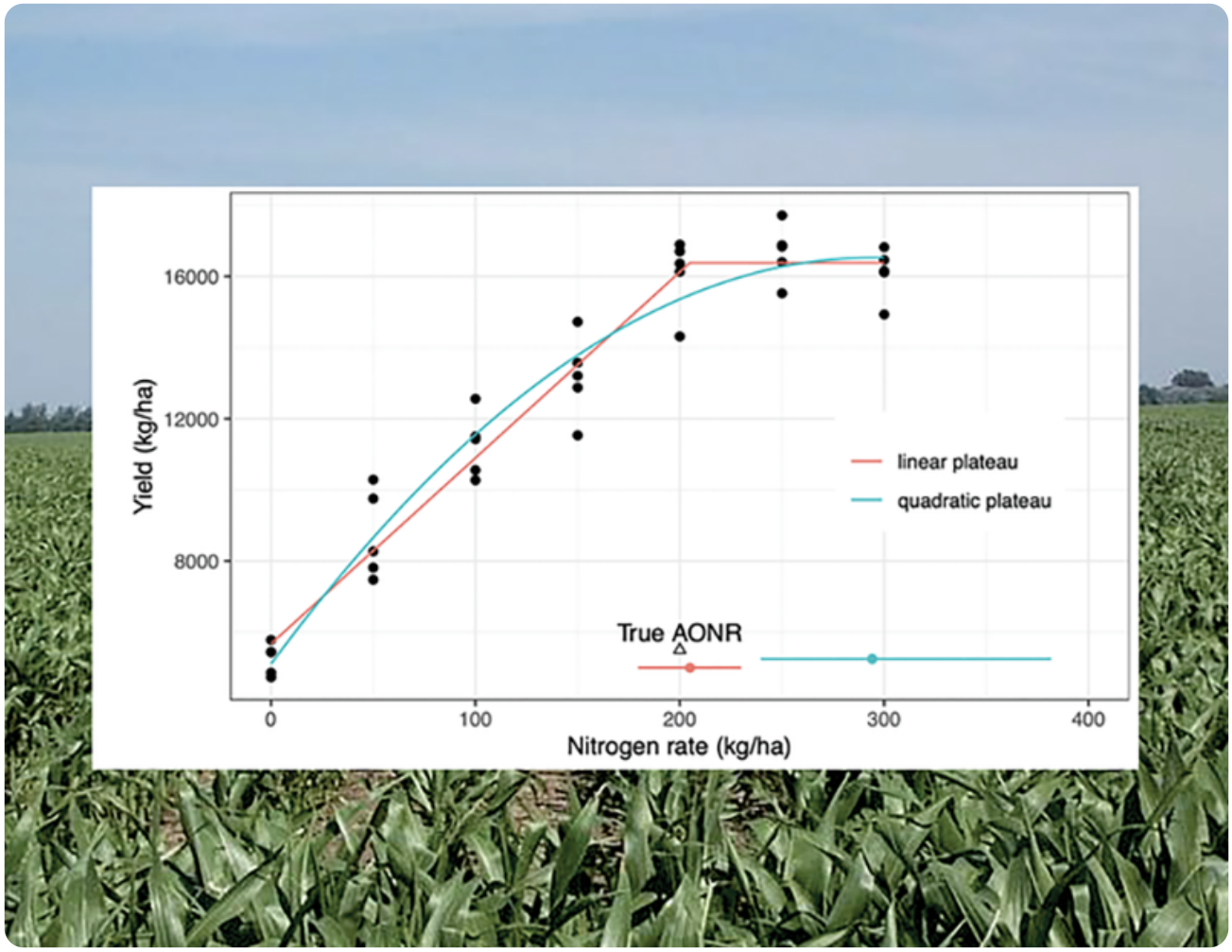

Different models result in different optimum nitrogen rate estimates. Image by Fernando Miguez and Hanna Poffenbarger.

For decades, agronomists have invested time and resources to estimate optimum nitrogen rates for cereal crops. The most common method for identifying agronomic optimum nitrogen rates (AONR) is to design a field experiment with several N fertilizer rates and then fit a regression model to the yield observations. But due to the serious consequences of both under-fertilizing (lost yield and profit) and overfertilizing (negative environmental impacts), a pair of researchers decided to take a closer look at AONR estimates.

In a recent study published in *Agricultural & Environmental Letters*, the scientists examined how the choice of experimental design and statistical analysis affects the accuracy and precision of the resulting regression analyses. The team considered two classic models, the linear-plateau and the quadratic-plateau, and found significant but different biases in both. The linear-plateau had a negative bias (underestimating AONR) while the quadratic-plateau had a positive bias (overestimating AONR). The results suggest that traditional experiments, which are relatively simple, lack precision and accuracy, and that improving the estimates will require increasing the number of N rates and replications used in field experiments and entered into models.

The team proposes that using either the best-fitting model or an average of both is preferable to always choosing either the linear-plateau or quadratic-plateau model.

Dig deeper

Miguez, F.E., & Poffenbarger, H. (2022). How can we estimate optimum fertilizer rates with accuracy and precision? *Agricultural & Environmental Letters*, *7*, e20075.

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