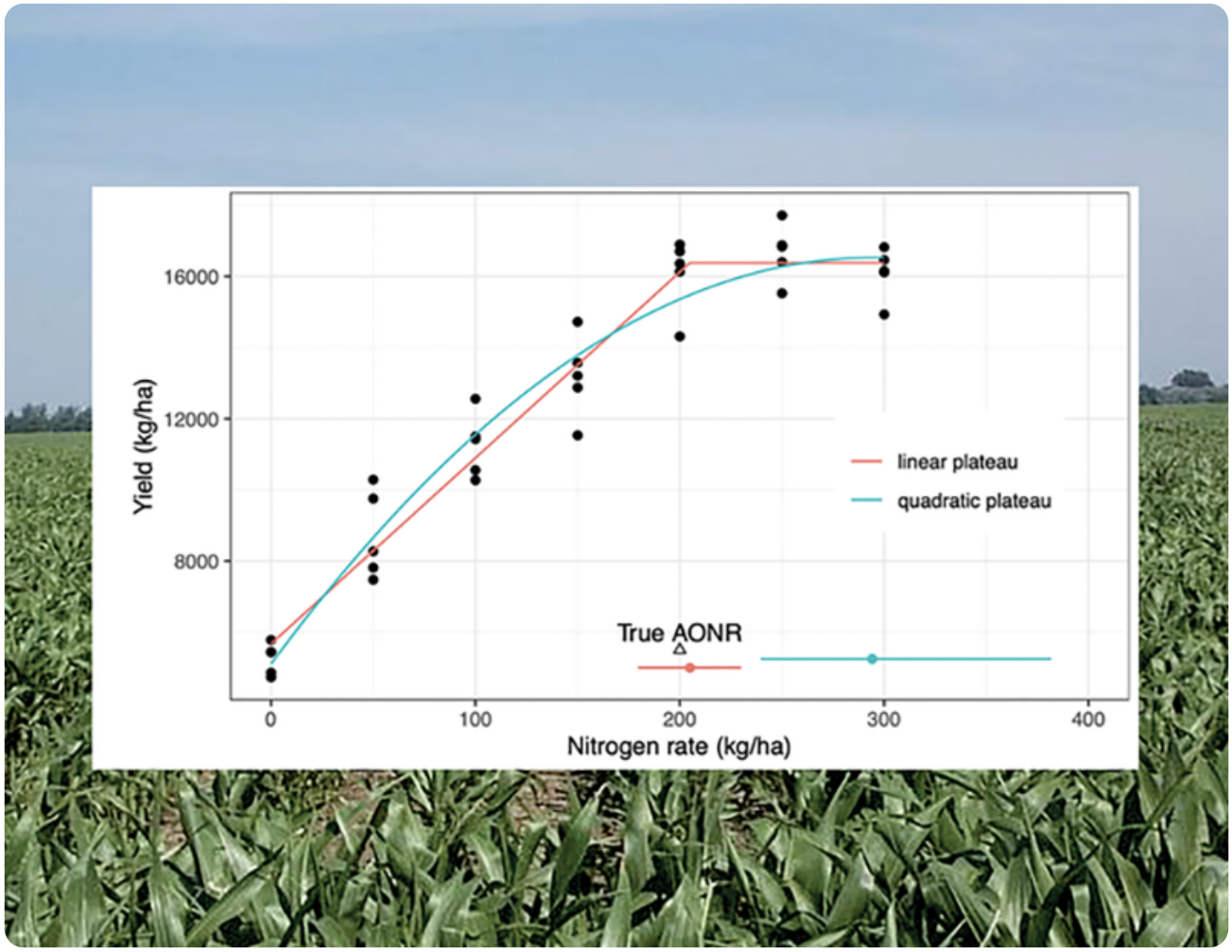
Science Societies

# 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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