

# From Molecular Gene Discovery to Field Performance

A six-suggestion guide to building community and helping researchers and reviewers identify elements needed within field experiments to make claims about crop productivity.

## 1) Use standard definitions of yield.

Was plot yield measured as opposed to single plant yield or individual yield components?

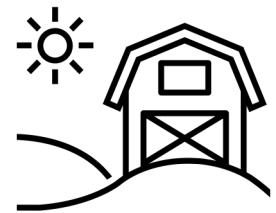


## 2) Trials should be replicated across plots, geographical locations, and years.

Were yield effects tested with sufficient individual and plot replication?  
Were effects tested across different geographical locations and years?  
Were field effects corrected (BLUPs, BLUEs)?  
Are yield effects stable across environments?

## 3) Varieties, planting densities, and other conditions should closely match those on farms.

Were yield effects tested in elite or commercially competitive germplasm?  
Was grain or biomass moisture controlled to a commercial standard?  
Were edits backcrossed into non-transformed wild-type plants?  
Were plots designed to avoid plant competition?  
Were expected, on-farm practices used?  
Was a standard planting density used?



Competition



Density



Edge



Sowing



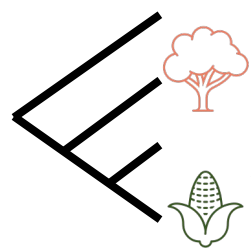
Irrigation



Harvesting



Fertilizer



## 4) Prioritize genes that plant breeding might have missed.

Is this gene or allele already present or fixed in commercial germplasm? If it is present, why hasn't it been fixed by plant breeders?

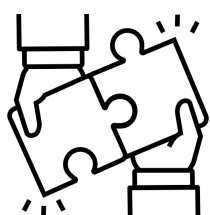
## 5) Appropriate controls should be used.

Was commercially relevant yield measured (inbred vs hybrid)?  
Were yield effects tested in a wild-type and empty-vector genotype?



## 6) Develop collaborations.

Reach out to colleagues, chat at conferences, and learn about existing public yield testing frameworks such as the Genomes to Fields Initiative, CGIAR, and university-based breeding programs.



Questions?

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Suggestions from: Scale up trials to validate modified crops' benefits. Khaipho-Burch et al., 2023 *Nature*.