The perils and promise of single-gene solutions to crop yield: extraordinary claims require extraordinary evidence

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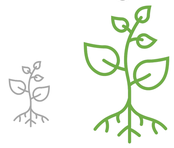
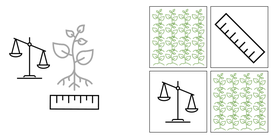
Peer review is failing within high-impact journals that publish **8-68% increases in intrinsic plant yield**. These publications are often flawed in how they measure field performance by:

Not utilizing elite germplasm



Backcross changes into ex-PVP lines or similar commercially competitive germplasm.

Measuring single plant vs plot yield

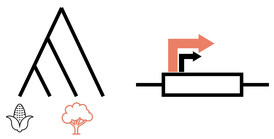


Yield data from single plants is not scalable to plot-wide effects.

Not testing G x E x M x T effects

Not following standard management

Forgetting evolution

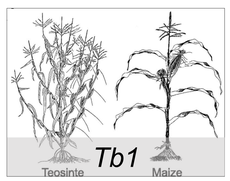


Investigate 'missed' or novel genetic variation.

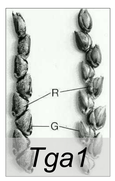
Not developing collaborations

Some single genes have worked well in domestication and to stabilize yield; however, **robust yield increases are delivered using genomic selection.** Our field needs to communicate yield testing standards better.

Limited env. adaptation



Improving harvestability



Processing & consumption

Global warming induced pests

Response to synthetic fertilizers

Figure adapted from Jesse Poland

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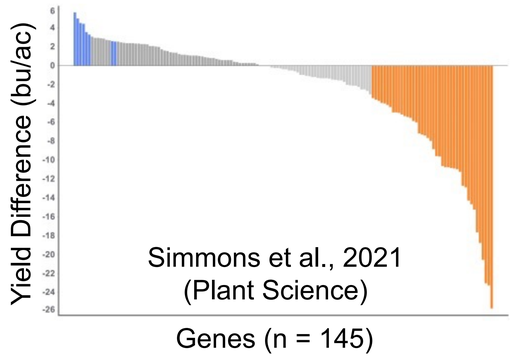
Molecular biologists don't seem to know this one simple trick to increase intrinsic plant yield.

(It's genomic selection)

Most of yield "breakthroughs" have **never** translated into significant gains once tested at scale.

1600+ gene constructs were field tested at scale, only 8 significantly increased yield and had small effects (1-4%).

Most gene constructs significantly decrease or have no effect on yield.



We suggest approaches to communicate to molecular researchers and reviewers when evaluating the impact of single genes on crop yield:

Take a zine!

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Take a flyer!