Data from: Field-scale experiments reveal persistent yield gaps in low-input and organic cropping systems

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Abstract

Knowledge of production-system performance is largely based on observations at the experimental plot scale. Although yield gaps between plot-scale and field-scale research are widely acknowledged, their extent and persistence have not been experimentally examined in a systematic manner. At a site in southwest Michigan, we conducted a 6-y experiment to test the accuracy with which plot-scale crop-yield results can inform field-scale conclusions. We compared conventional versus alternative, that is, reduced-input and biologically based–organic, management practices for a corn–soybean–wheat rotation in a randomized complete block-design experiment, using 27 commercial-size agricultural fields. Nearby plot-scale experiments (0.02-ha to 1.0-ha plots) provided a comparison of plot versus field performance. We found that plot-scale yields well matched field-scale yields for conventional management but not for alternative systems. For all three crops, at the plot scale, reduced-input and conventional managements produced similar yields; at the field scale, reduced-input yields were lower than conventional. For soybeans at the plot scale, biological and conventional managements produced similar yields; at the field scale, biological yielded less than conventional. For corn, biological management produced lower yields than conventional in both plot- and field-scale experiments. Wheat yields appeared to be less affected by the experimental scale than corn and soybean. Conventional management was more resilient to field-scale challenges than alternative practices, which were more dependent on timely management interventions; in particular, mechanical weed control. Results underscore the need for much wider adoption of field-scale experimentation when assessing new technologies and production-system performance, especially as related to closing yield gaps in organic farming and in low-resourced systems typical of much of the developing world.

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