Higher grain and silage yield from farm fields with greater soil organic matter

From the state level to the international arena, soil health initiatives promote the adoption of agricultural practices that rebuild soil organic matter (SOM) concentrations. Re-building SOM in agricultural soils improves soil fertility, as SOM increases aeration, water availability and nutrients critical for plant growth. However, the extent to which improvements in soil fertility translate to yield benefits on working farms is a key unknown which, if addressed, would provide information necessary for optimizing on-farm practices.

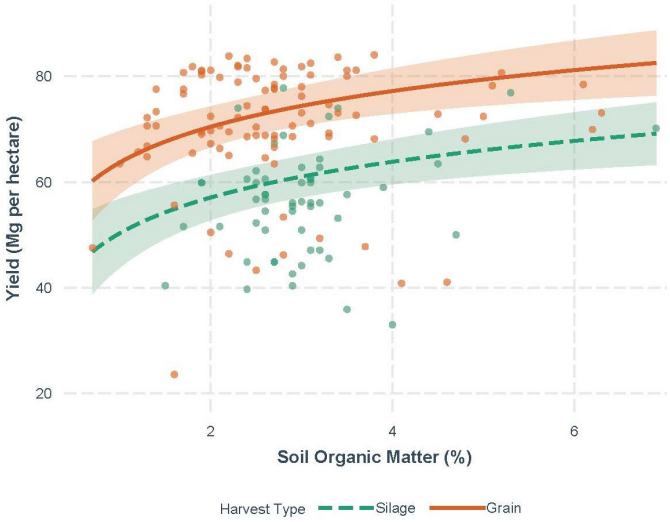

Figure 1:More soil organic matter (SOM) is associated with higher yields of grain and silage. Points are each of the 179 fields, whereas the lines (with error bounds) depict the SOM-yield relationship conditioned for other factors that influence yields, such as N.

Controlled experimental field trials are extremely valuable for understanding *potential* impacts of management on SOM and yields. However, these findings may not extrapolate to the "real-world" where farmers must make management changes to deal with unexpected events related to growing conditions or business operations. Quantifying SOM-yield relationships on working farms is therefore a necessary and essential complement for understanding the *realized* impacts of SOM on yield.

Scientists at Environmental Defense Fund, the University of Wisconsin Madison, and the Yale School of the Environment undertook the work necessary to quantify realized impacts. Across a network of privately-owned, working farms, they find that increasing SOM concentrations are associated with increases in corn and silage yields, with the greatest gains occurring between 0.7 and about 4% SOM (Figure 1).

The new work is published in the *Soil Science Society of America Journal*, and leveraged a regional network of farms participating in the Wisconsin and Minnesota Discovery Farms programs, which comprise farmer-led research and outreach efforts to determine the economic and environmental effects of agricultural practices. The work further shows that coupling increases in SOM with greater crop rotational diversity may provide additional yield benefits.

These on-farm data provide evidence that results from controlled experiments on the positive relationship between SOM and crop yields are observed in the real-world context of working farms. Collectively, given the reproducibility of the SOM-yield relationship, there should be high confidence in the goals of soil health initiatives that rest on rebuilding SOM in agricultural soils to improve agricultural and environmental outcomes.

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