Publication brief

Yale SCHOOL OF THE ENVIRONMENT
The Forest School

Healthy soils protect corn yields and lower crop insurance payouts under drought

Corn yields in the U.S. could drop between 20-80% given the increasing frequency and severity of floods and droughts. Farmers increasingly depend on the Federal Crop Insurance Program to manage the resulting yield risks. From 2001 to 2010 crop insurance indemnities totaled $4.1 billion. In 2011 alone, $10.8 billion was paid.

Restoring soil organic matter in agricultural soils where it has been depleted improves soil water infiltration and retention, which may buffer crop yield risk against extreme weather events. Yet crop insurance largely does not use information on soils or management practices to determine premiums. Instead, rates are based on historical yield data excluding the worst years but doing so does not account for the increasing frequency of droughts and floods, and so underestimates risk.

Scientists at Yale School of the Environment, The Nature Conservancy, and Granular show that in U.S. corn producing counties yields increase with average soil organic matter content under drought and crop insurance payouts decrease. The work, published in *Environmental Research Letters*, used 12,376 county-years of data on corn yields and data on crop insurance payouts and indemnities from across the U.S. **An increase in soil organic matter of one percent at the county level was associated with a 36% reduction in the mean proportion of liabilities paid under severe drought conditions and a 2.2 Mg ha^{-1} (35 bu ac^{-1}) increase in corn yield**.

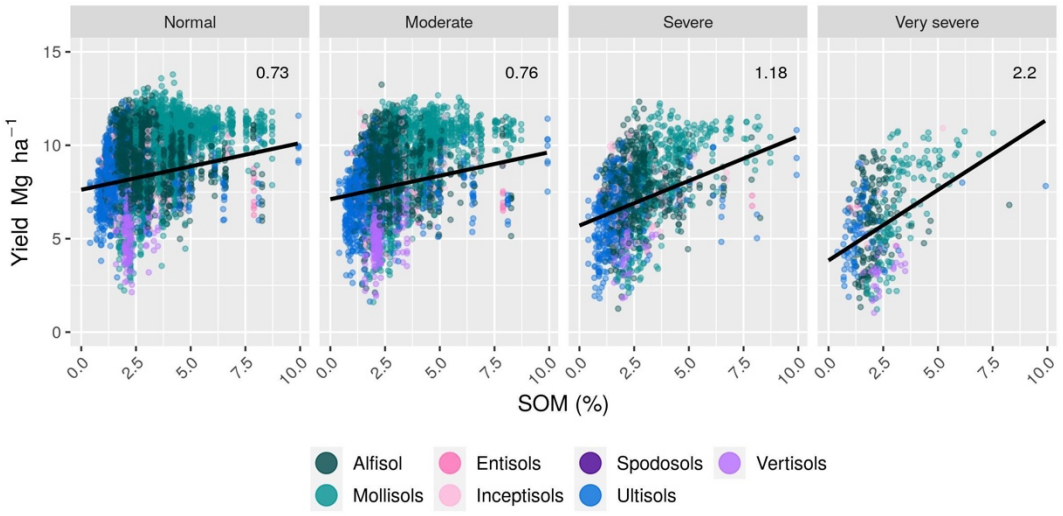

Figure 1. More soil organic matter (SOM) is associated with higher yields in a normal weather year, and the positive effects of SOM are progressively greater as drought becomes more severe (shown as a steeper slope as you move from left to right across the figure plates).

These results highlight opportunities for agriculture finance, policy, and insurance that are based not just on historical yield data but also soil organic matter data that is predictive of yield loss risk due to drought. Given that the work used county-level yield, insurance and soil information, there is a need for further work to test how the findings translate to soil health initiatives, which focus on building soil organic matter at the farm level with the expectation that it will help 'drought-proof' crop production and hence build food security. The results support the goals of such initiatives, highlighting how management of soil health might be a key adaptation strategy for sustaining agricultural production, rural communities, and food-supply security in a world experiencing increasingly extreme weather.

For more information, please contact lead author of the paper Dan Kane (daniel.kane@yale.edu)