

No-Till and Snow Can Help Crops Grow

“Water availability is a major limiting factor of dryland crop productivity in the Palouse,” says Agricultural Research Service soil scientist David Huggins. “We receive 70 percent of our yearly precipitation in the winter, and we need to store as much of that water as possible in the soil so it can be used in the summer by crops.”

Which is why Huggins sent two technicians out in a January snowstorm to measure how much snow had fallen on two nearby crop fields. It was the beginning of a field-scale study that compared how no-till and conventional-till management affect snow accumulation, snow distribution, and the spatial variation of soil water.

“One of the benefits of no-till is that crop residues left standing on the soil surface can insulate soil from water evaporation and trap snow to provide more stored water,” explains Huggins, who works at the ARS Land Management and Water Conservation Research Unit in Pullman, Washington. “But until now, we hadn’t measured how crop residues could affect snow accumulation and soil water levels across an entire field.”

The study was conducted near Pullman, at the Washington State University Cook Agronomy Farm (CAF) and a neighboring private farm, both of which have the hilly topography characteristic of the region known as “the Palouse.” Some of the CAF has been under continuous no-till management since 1999. For 2 years, snow depths, density, and soil water storage were measured manually at hundreds of points across the fields on both farms. Residue height

at data-collection points was also measured on the no-till fields.

The researchers found that standing wheat residue on the no-till farm significantly increased the amount and uniformity of snow cover across the entire field. Snow depths on the no-till field ranged from 4 to 39 inches with an average depth of 11 inches, while snow depths on the conventional-till field ranged from 0 to 56 inches with an average depth of 8.5 inches.

This pattern made soil water distribution more uniform and increased soil water recharge rates on the no-till farm. The more uniform snow distribution under no-till was particularly apparent for ridge tops and steep south-facing slopes where there

was typically 4 to 8 inches more snow than on conventionally tilled fields.

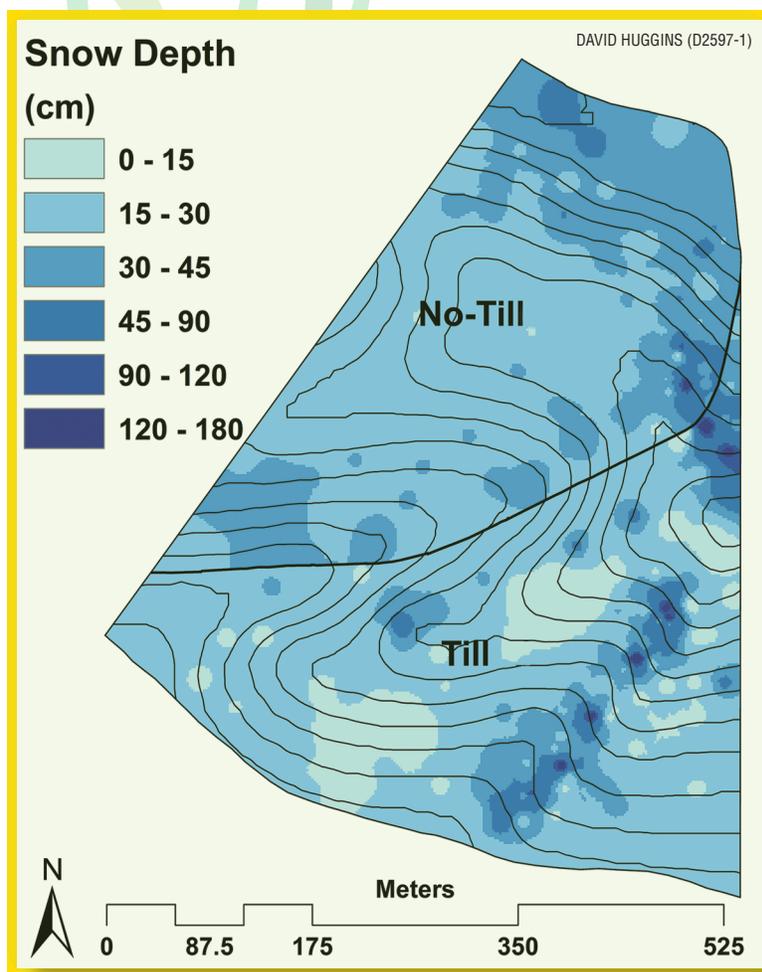
“On conventionally tilled fields, snow just blows off ridge tops. Then it accumulates as large drifts on north slopes and bottom lands, where it can cover winter wheat crops that have emerged,” Huggins says. “The higher snow cover on conventional-till north slopes can really slow down crop growth and development. In addition, farmers have to work around more wet or snow patches in the spring—and when the snow drifts melt, soil erosion is promoted.”

Huggins calculated that the greater storage of soil water in no-till systems could increase winter wheat yield potential by 13 bushels per acre on ridge tops, 6 bushels per acre on south-facing slopes, and 3 bushels per acre in valleys. As a result, regional farmers could increase their winter wheat profits by an average of \$30 per acre and as much as \$54 per ridge-top acre.

“We want to encourage Pacific Northwest farmers to switch to no-till,” Huggins says. “This study helps us do that, because we can use the results to show how no-till positively influences soil water storage and yield potential across a field—and it also links this information to field-scale precision management of soil fertility.”—By **Ann Perry**, ARS.

This research is part of Climate Change, Soils, and Emissions, an ARS national program (#212) described at www.nps.ars.usda.gov.

David Huggins is in the USDA-ARS Land Management and Water Conservation Research Unit, Johnson Hall, Washington State University, Pullman, WA 99164; (509) 335-3379, david.huggins@ars.usda.gov. ❀



Snow depth after a January snowstorm on a field of no-till wheat (with standing crop residue) and conventionally tilled wheat (no residue). The residue in the no-till crop promoted a more even snow distribution and less drifting.