



Subsurface Drainage and Soil Temps

Intro

It has commonly been believed that a tile-drained field warms up faster in the spring compared to a surface-drained or undrained field. Researchers from University of Minnesota and NDSU put this to the test in the early 2000's. They studied two sites in northwest Minnesota to investigate the influence that drainage and lateral spacing has on soil temperature throughout the spring and summer.

Site & Testing

Conventional drainage systems were installed in two fields in the Red River Valley in NW Minnesota. These sites are representative of the region with flat topography and poorly drained soils with low permeability. The spacing of the laterals in these fields were 16, 40, 60, and 80 feet, and the sites also had an “undrained” or surface-only drained section that was monitored.

At each site, soil temperature was measured throughout the soil profile up to 4-feet deep. Readings were taken every 2 hours then averaged to get a single daily data point at each of the 4 measured depths.

Results

On average throughout the soil profile, temperatures were about 1.3°F higher in the drained plots compared to the undrained. The tighter the spacing, the greater the difference in temperature. However, the greatest difference/advantage was in the subsoil (12-24” deep) and during the early growing season (late May to early July).

Takeaway

This study proves that there is an advantage of warmer soils with a subsurface drainage system. But with the biggest differences being in the subsoil (past the seedbed) and in late spring/early summer, the difference may not be exactly as expected.

Another factor that likely plays a large part in topsoil warming is what's happening on top of the soil such as crop residue, cover crops, tillage practices, etc.

In any case, the name of the game seems to be the quicker the water table drops below the soil surface, the better. Since dryer soils warm faster, a water management system (conventional or conservation) gives farmers the potential to take advantage of more growing days which is more critical the further north you go.

Citation:

Jin, C. X., Sands, G. R., Kandel, H. J., Wiersma, J. H., & Hansen, B. J. (2008). Influence of Subsurface Drainage on Soil Temperature in a Cold Climate. *Journal of Irrigation and Drainage Engineering*, 134(1), 83–88. [https://doi.org/10.1061/\(asce\)0733-9437\(2008\)134:1\(83\)](https://doi.org/10.1061/(asce)0733-9437(2008)134:1(83))

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