Northern NY Agricultural Development Program
2016-2017: Final Project Report

Quantifying Long-Term Agronomic and Water Quality Impacts of Tile Drainage in Northern New York

Project Leaders:

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Collaborators:

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- Champlain Valley Agronomics, Peru NY
- Stephen Mahoney, River Bend Ag & Environmental Services, Altona, NY

Background:

Tile drainage remains a critical practice for Northern New York farms and improves crop production and profitability in poorly drained soils. With proper installation and nutrient management, nitrogen (N) and phosphorus (P) concentrations in tile drainage water are substantially lower than typically found in surface water runoff. In addition to crop production and soil quality enhancements associated with improved drainage, tiling can reduce soil erosion and total P losses in some settings.

While tiling may reduce P losses, it can increase N losses in some cases due to greater mineralization rates and drainage water fluxes compared to an undrained state. However, enhanced root growth and yields from tiling poorly drained soils also result in greater crop yields and nutrient removal over time compared to naturally poorly soils.

The practice of tiling has received heightened scrutiny due to the fact that some degree of nutrient export occurs with tile drainage. However, there is a lack of research directly comparing water quality and agronomic benefits of tile-drained and undrained sites in the Northeast using side-by-side field comparisons. There is a clear need for long-term

studies that better quantify cost and benefits of tile drainage. Due to the fact that some level of nutrient loss is inevitable with all production agriculture, benefits of tiling must be comprehensively evaluated with respect to field crop production, soil health, and potential water quality impacts.

The objective of our project was to complete the installation and setup of an edge-of-field study designed to compare long-term agronomic and runoff water quality between a tile-drained and naturally drained field.

Methods:

The field site for this study is owned and operated by Adirondack Farms, LLC, Peru, NY. Both fields are mapped as Tonawanda silt loam and in 2nd year corn silage production.

Corn yields in each field were measured by a yield monitor; the data will be used to compare yields over time between the fields (maps in Appendix). Yield maps were prepared by Champlain Valley Agronomics, Peru, NY.

Surface water flumes were installed in late fall 2016. Extensive erosion occurred over the winter due to incomplete construction of flumes and a lack of power to operate the pump tank system. Adirondack Farms regarded?? the approach to flumes, created berms along the flume wing walls, and seeded with grass.

Electrical work for the subsurface pump tank system and surface water flumes was completed in July 2018 by David Trombley (Trombley Consulting).

A shed was constructed to house tile drain flow monitoring and sampling equipment. A small flume is used to measure tile flow from the tile-drained field (See photos under Results).

New York State Electric and Gas completed power installation on 8/21/18.

The pump tank system was inspected and tested by David Trombley and is fully operational.

A melting event on 1/12/18 verified that the surface flumes are fully operational.

Results:


Figure 1 (left). Tile drain monitoring setup inside shed for tile-drained field, NNYADP Tile Drainage project, 2017.
Figure 2. (right) Flume for measuring surface water runoff for tile-drained field, NNYADP Tile Drainage project, 2017.


Figure 3 (left). Flume for measuring surface water runoff for undrained field, NNYADP Tile Drainage project, 2017.
Figure 4 right). Flume capturing surface runoff during snowmelt event on 1/12/18 for undrained field, NNYADP Tile Drainage project, 2017.

Figure 5. Flume capturing surface runoff during snowmelt event on 1/12/18 for tile-drained field, NNYADP Tile Drainage project, 2017.

Corn silage yields for each field were measured at harvest by Adirondack Farms using a yield monitor. Yield maps show that the tile-drained field had approximately a 2.8 ton/acre yield (based on adjusting yields to 35% dry matter basis) advantage over the undrained field (Figures 2 and 3 in Appendix). The fields have the same soil type (Tonowanda silt loam) and were planted with same corn hybrid with identical nutrient applications. Yields will be monitored each year of the study to compare yields and better understand potential economic advantages of tiling.

Our site is now fully instrumented and capable of monitoring surface and tile drainage runoff flows. Runoff will be continuously monitored year round, including during the winter and snow melt events. Previous research funded by NNYADP has demonstrated that snow melt events can account for a large percentage of annual runoff and nutrient loading from fields.

Conclusions/Outcomes/Impacts:

Results from this ongoing project will provide important data comparing agronomic (i.e., crop yield/quality) and runoff water quality between a tile-drained and undrained field under highly similar field conditions. These data are needed given the lack of side-by-side field studies designed to quantify runoff and nutrient loading differences between tile-drained and naturally poorly drained crop fields in Northern New York and the Northeast region.

Outreach:

Results from this project will be shared with the NNYADP publicist Kara Lynn Dunn, and be presented at professional meetings once sufficient data has been collected. We will also share results with farmers, NRCS, Extension educators, and others involved with agricultural water quality management in the Northern New York region.

Next Steps:

The next step for this research is to monitor and collect data from all runoff events during 2018.

Acknowledgments:

We thank Adirondack Farms and Champlain Valley Agronomics for cooperating with us on this research. We also thank David Trombley for wiring the electrical system.

Reports and/or articles in which results of project have been published.

None to date.

For More Information:

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Appendix: Quantifying Long-Term Agronomic and Water Quality Impacts of Tile Drainage in Northern New York, 2017

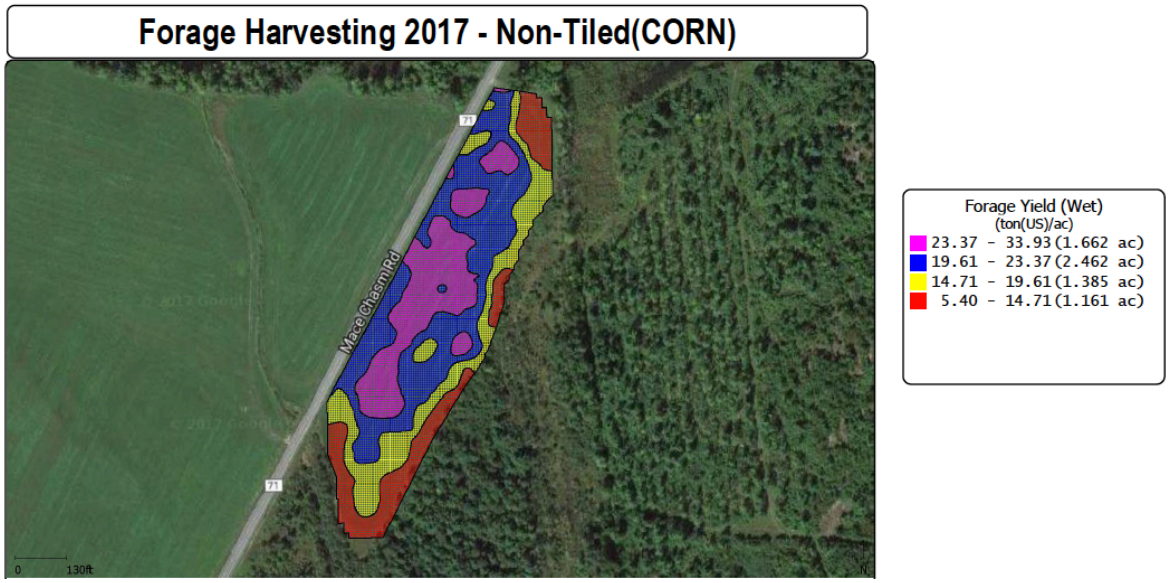

Figure 1. Corn yield, measured by yield monitor, in undrained field, NNYADP Tile Drainage project, 2017. The average yield at 35% dry matter for the field was 21.7 tons/acre.

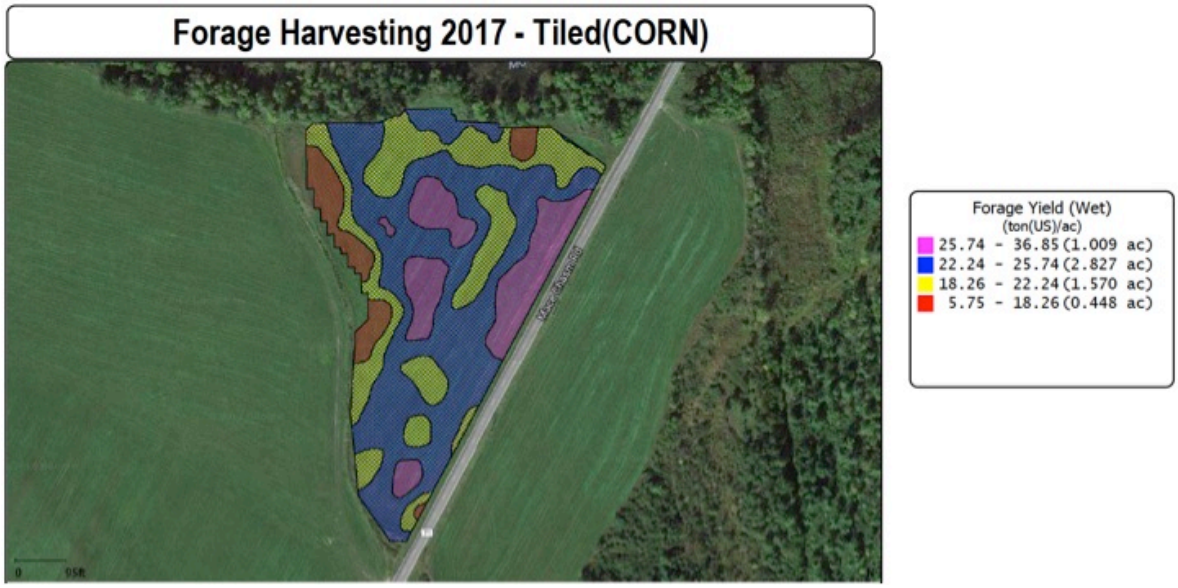

Figure 2. Corn yield, measured by yield monitor, in tile-drained field, NNYADP Tile Drainage project, 2017. The average yield at 35% dry matter for the field was 24.5 tons/acre.