NDSU EXTENSION SERVICE
NORTH DAKOTA STATE UNIVERSITY

MAKING A DIFFERENCE

# What Should We Do First On Sodic Soils; Tile or Apply the Amendments?

## The Situation

For increased profitability, farmers and landowners need to make the best use of every available inch of soil. That involves remediating saline and sodic areas to maximum production. Saline and sodic soils have been reported in North Dakota since the 1960s. Rising groundwater levels and resulting capillary rise of soil water leads to the accumulation of excessive soluble salts (salinity) and sodium (sodicity). Saline soils having higher levels of calcium ($Ca^{2+}$)-based salts will have good structure through which excess water can move. Sodic soils have extremely poor soil structure with dense soil layers, resulting in very slow permeability of water through the soil profile. Remediation of salts and sodium will require lowering the groundwater level and application of amendments that add calcium ($Ca^{2+}$) in the case of high sodium ($Na^{+}$) levels.

An effective way to lower groundwater levels is to install a field tile drainage system. Since tiles are generally three to four feet below the surface, the efficiency of a tile drainage system depends upon the permeability of soil layers above the tiles. Knowing this requires analyzing soils for salts and $Na^{+}$. In case of high $Na^{+}$ levels, not adding $Ca^{2+}$ can render tiling ineffective.

## Extension Response

In July 2014, the Langdon Research Extension Center (LREC) tiled a field that had excessive levels of $Na^{+}$ and moderately high levels of soluble salts. This consisted of 12 research plots with three replications.

After tiling, each research plot was sampled four feet deep to determine salt and $Na^{+}$ levels. In June-July of 2015, gypsum, beet lime and elemental sulfur were spread and thoroughly incorporated into the randomized plots, with a control. The plots were again sampled in 2016 to determine salt and $Na^{+}$ levels, two years after tiling.

## Impacts

Soluble salt levels decreased in all 48 samples (23.94 to 75.90%). However, soil $Na^{+}$ levels increased in 22 samples (1.18 to 178.49%). This may be a direct result of losing salts under improved drainage. Also, the highest $Na^{+}$ increase was observed in two plots with the shallowest average groundwater levels in 2015 and 2016. The same plots had a net average decrease for salts for all depths (56% and 47%). In the remaining 26 samples, $Na^{+}$ levels decreased (1.03 to 44.38%).

Increased $Na^{+}$ levels mean higher amendment costs and longer wait to achieve maximum productivity.

## Feedback

*"Very good information. We need to do it right".*

*"Now I will soil test first before I will even think about tiling".*

## Public Value Statement

Analyzing soils for salts, sodium and potential remediation before installing an expensive tile system could save money and ensure correct use of technology.

## Primary Contact

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## Resource Links

https://www.ag.ndsu.edu/langdonrec/soil-health