



## Drainage for the Long Haul – 35 years of Drainage Data in Indiana

Drainage is a long-term investment with many variables influencing performance and effectiveness that average out over time. This culmination of 35 years of studies from Purdue University is one of the most complete long-term analysis of the role that drainage and drain spacing plays in planting date, crop yield, cover crop effectiveness, drain flow, and nitrate loss. Purdue has summarized this research into a 3-part series of summary documents as well as explanatory videos.

<https://ag.purdue.edu/agry/drainage/Pages/New-Summaries.aspx>  
<https://www.youtube.com/watch?v=34Mk7zmFDEc>

### The Site

- Southeast Indiana – Butlerville, IN
- Clermont (Cobbsfork) silt clay loam – poorly drained, low organic matter, highly erosive
- Drainage System (installed spring of 1983)
  - Spacing: 16', 33', 66', & 132' (5, 10, 20, & 40 m)
    - 132' plot was considered undrained
  - 2.5' to 3' deep (above fragipan restricting layer)
  - 4" perforated plastic laterals
- Crops:
  - Continuous corn with chisel plow tillage (1984 to 1993)
  - Corn & Soybean rotations with no-till and cover crop rotations (1994 to 2018)

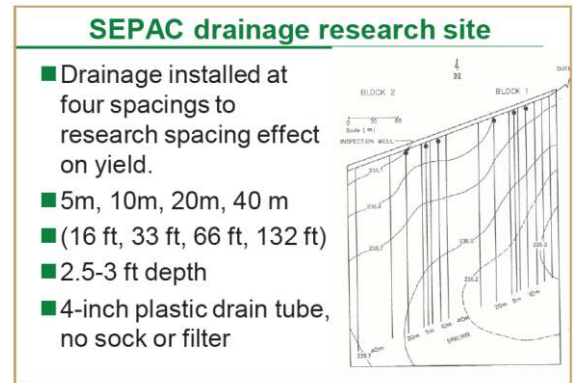


Figure 1. SEPAC drainage spacing field layout.

### The Testing

- Monitored characteristics of plot including:
  - Farming practices and timing
  - Yield (all crops including cover crop biomass)
  - Drainage volume
  - Nitrate-N concentrations
  - Rainfall

### The Results

- Fields are “ready” up to 15-days earlier (narrowest spacing vs. undrained) and reduce need to replant
- Drainage leads to effective cover crops, healthier soil, & higher yields (Figure 3)
  - More cover crop biomass in drained plots
  - Conservation practices + drainage increased corn yields ~20%
- Drainage increases corn yield; not significantly with soybeans
  - Up to 24-bu/acre corn yield difference between drained and undrained (Figure 4)
  - Greater benefits expected in more typical farming operations on similar soils
- Tighter spacing = more drain flow = more nutrient loss
  - 12% to 28% of annual rainfall went to drainage
  - Nitrate-N concentrations remained consistent between spacings
    - More water leaving site = more N it brings with it
- Conservation practices reduce nitrate losses
  - By managing agronomic practices (reduced N application amounts, introducing no-till, corn-soybean

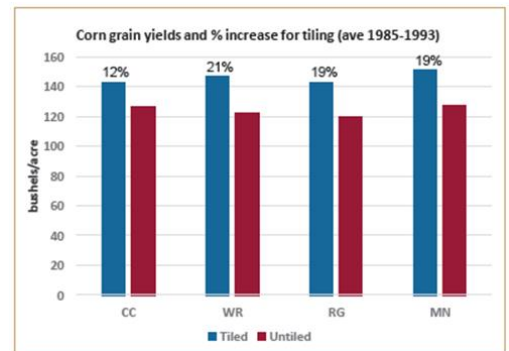


Figure 3. Average corn yields over the 9-year agronomic treatment experiment. Average continuous yields were 16 to 25 bu/A higher in the tilled than in the untilled block, depending on the agronomic treatment.

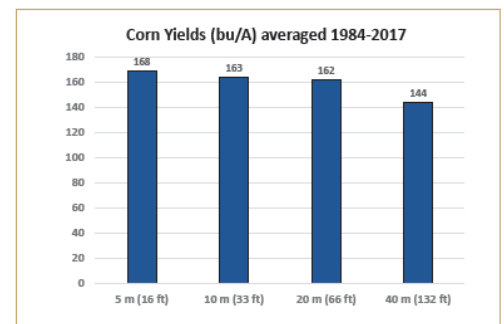


Figure 4. Corn yields averaged over all corn years of the 1984-2017 time period showed relatively little difference in corn yields among the 5-, 10-, and 20-m drain spacings, but a 24 bu/A reduction in the undrained control compared to the narrowest drain spacing.



rotation, and cover crops), N concentrations below the drinking water standard (10ppm) are achievable (Figure 5).

### The Takeaway

This long-term study supports many common beliefs of tile drainage systems as well as confirms findings from other shorter-term studies: better drainage means you can get into the field earlier, drainage increases yield, and more intensive drainage leads to more nitrate leaching due to increased overall drain flow. However, you can mitigate nitrate loading by using agronomic conservation practices.

These studies spotlight the need for a good drainage system to effectively implement other conservation practices (to reduce nitrate leaching) which leads to higher crop yields and healthier soils. In short, “Drainage Pays.”

-Trey Allis

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### Citation:

Eileen Kladvko. (2020). *Drainage for the long haul: Key takeaways from the SEPAC Study*. West Lafayette, Indiana; Purdue University.

Eileen Kladvko. (2020). *Soil drainage and crop yields: Insights from long-term SEPAC Study*. West Lafayette, Indiana; Purdue University.

Eileen Kladvko. (2020). *Soil drainage impacts on cover crop growth and soil improvement: Insights from long-term SEPAC Study*. West Lafayette, Indiana; Purdue University.

Eileen Kladvko. (2020). *Soil drainage and nitrate losses to surface waters: Insights from long-term SEPAC Study*. West Lafayette, Indiana; Purdue University.

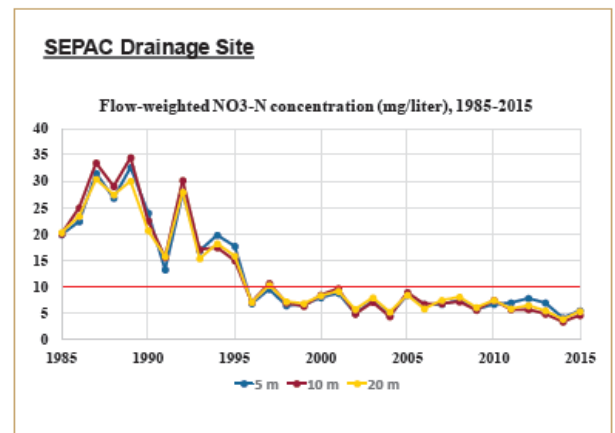


Figure 5. Nitrate-N concentrations in drainflow from 1985-2015. See text for detailed explanations.