Drainage Water Management in Southeast Iowa

Intro

In the early days of “Conservation Drainage” or “Drainage Water Management” Iowa State implemented side-by-side comparisons of multiple drainage practices to better understand their performance, benefits, and impacts. The first 4 years of data was published in 2012 with the remaining 5 published in 2017.

With year-to-year variabilities in weather (specifically rainfall amount and timing), it may be difficult to get an idea of long-term affects of drainage systems with only a handful of growing season data points. The additional 5 years of data at this site helps provide a more complete picture benefits and impacts of various drainage practices.

Site & Testing

Four drainage practices (undrained, conventional drainage, controlled drainage, and shallow drainage) were compared on side-by-side plots of 3- to 6-acres (8 total plots on 42-acres). These systems were installed in 2007 in silty clay loam soil and farmed in a corn-soybean rotation commonly found throughout Iowa and the Midwest. At this Southeast Iowa research farm, these plots monitored rainfall, drainage flow, water table depth, Nitrate-N concentration, and crop yield since 2007.

Each drainage system was designed with the same maximum drainage coefficient of ¾”. Depth and spacing of the drainage systems are as follows:

- Conventional Drainage
  - 4’ depth, 60’ spacing
- Controlled Drainage
  - 4’ depth, 60’ spacing
  - Stoplogs placed during growing season; removed for fieldwork
- Shallow Drainage
  - 2.5’ deep, 40’ spacing

Results

Throughout all the drainage practices, the Nitrate-N concentrations remained similar. So, one way to reduce the overall amount of nitrate leaving a farm is to reduce the overall amount of water leaving the farm. This study showed two practices capable of reducing overall flows. Both shallow drainage (shallower laterals taking out less overall water) and controlled drainage (conventional drainage system with stoplog structures inline to “dam” up the water and raise the water table throughout the growing season), both proved to reduce flow by about 60%, and overall nitrate load by about the same.

Rainfall amount and timing played a fairly significant factor over these years of data as it does in any agronomic situation. This had an influence on data year over year, but given enough time, such as this site when combined with data from the 2012 study, data tends to average out and trends can emerge. One of these is with yield. Undrained plots had an average of 6% difference in yield compared to conventional drainage.

Takeaway

Conventional Drainage can be a good tool increase corn and soybean yield, but if you reduce your overall outflow by either shallow or controlled drainage you can still have the yield benefit while reducing the total amount of Nitrates leaving the site.

Citation:

Schott, L., et al. “Drainage Water Management Effects over Five Years on Water Tables, Drainage, and Yields in Southeast Iowa.” *Journal of Soil and Water Conservation*, vol. 72, no. 3, 2017, pp. 251–259., doi:10.2489/jswc.72.3.251.

https://www.jswconline.org/content/72/3/251