Agricultural Drainage

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Indiana

Drainage and Yield Studies

Subsurface drainage has been used on large areas of Indiana's cropland for many years, and guidelines for drain spacings, sizes, and systems are well established for most soils. More recent research on subsurface drainage and crop yield has occurred on a major soil type that was traditionally not recommended for subsurface drainage due to low permeability and problems with silting-in of the drains. The Clermont silt loam soil ("buckshot ground," "crawdad flats") and similar soils in southeastern Indiana and southwestern Ohio are wet in spring, causing delayed planting, shallow rooting, and subsequent drought stress later in the summer. Surface drainage, primarily by land leveling (and shallow surface ditches) has been the recommended practice. In 1983, new studies were begun at the Southeast Purdue Agricultural Center (SEPAC) in Jennings County to test the effectiveness of per-forated plastic drain tubing for drainage and subsequent crop growth and yield. In one 6 acre experimental area, plots were established under subsurface drained (50 ft spacing) and undrained conditions for comparisons of tillage system, cover crops, manure application, and rotation with a hay crop. Surface drainage on these plots was fair, with pockets of ponded water persisting in some areas for several days after a rainfall. Corn yield differences between subsurface-drained and non-subsurface drained plots over an 8 year period averaged 14 to 23 bu/acre, depending on the particular treatment. Most of the measurable improvements in soil tilth and organic matter in the cover crop and rotation treatments were greater in the presence of subsurface drainage than in its absence, and no-till treatments performed better with subsurface drainage.
Perhaps the most significant benefit of subsurface drainage is in areas of a field where surface drainage is poor— in some years the swales without subsurface drainage had enough ponded water to destroy the crop in that area, whereas drained plots were able to more quickly remove the ponded water.

In an adjacent 12 acre area of the same field, plots with 4 different drain spacings were established in order to determine the optimal spacing. This area of the field had excellent surface drainage. Results from 10 years of continuous corn showed the widest spacing (132 ft, considered to be an "undrained" control for this soil) to average 10 bu/acre (6.4%) lower yields than the narrowest spacing (see graph). Optimal drain spacing for this soil based on yield appears to be somewhere between 33 and 66 ft. Some of the yield advantage of the narrower spacing is due to the more timely planting possible on the drained plots. The 10 bushel average yield difference between the narrowest (16 ft) and widest (132 ft) spacing was less than expected, and may reflect both the excellent surface drainage of this site and the fact that the 132 ft spacing is not truly "undrained."

The 10-year average corn yields recorded at the SEPAC site for four different drainage spacings.