



AGRICULTURAL ENGINEERING NEWS LETTER

AGRICULTURAL EXTENSION DIVISION
UNIVERSITY OF MINNESOTA

UNIVERSITY FARM, ST. PAUL—SEPTEMBER 15, 1935—No. 42

TILE DRAINAGE

J. H. NEAL

During the past seven or eight dry years tile drainage has been nearly forgotten. However, last spring when the precipitation was slightly above normal, many fields were too wet for efficient farming.

Drainage is the first prerequisite of successful farming. If it is not natural it must be provided for by artificial means. Approximately one-fourth of our cultivated farm land is too wet, at least part of the year, for the most efficient cropping.

Tile drainage should not be looked upon as an expense but as an investment. A tile drainage system, properly installed, will pay for itself during three or four wet years. Contrary to popular belief, a drainage system does no harm during a dry season, as only the excess or gravity or free water is taken out of the soil by the drains. In fact, a tile system may be a help to a crop during a dry season, if the drought has been preceded by a wet spring; for, in such a case, without good drainage, the water level in the soil is high during the early growing season and the root growth of most plants will be very shallow, as they will not penetrate into a saturated soil. Later in the season, when the water level is dropping rapidly, the roots, by that time more or less stunted, cannot keep up with the lowering water table and the plant soon suffers or dies for lack of moisture. On the other hand, if the water table could have been held lower by tile drains when the roots were making their greatest growth, their penetration would have been greater and the subsequent damage by drought greatly reduced.

Not only is a tile drainage system an aid to crops during wet and dry years, but it is also an aid in soil erosion control. A well drained soil will absorb much more precipitation than an undrained soil. Thus it reduces the amount of surface run-off and consequent soil washing.

A drainage system, like a house, should be planned before it is constructed. The plan should be complete even though but a few lines of tile are put in at a time. In bringing a new farm under cultivation, the first step is to provide for the removal of the surface and flood waters from all parts of the field by providing continuous runways where they do not exist naturally. These runways may be provided as permanent dead furrows or by connecting

pockets with wide shallow V-shaped ditches made with a road grader or terracer. Such ditches should lead to definite outlet channels. After the land has been cropped for a few years, more intensive drainage may then be profitably installed in the correct locations.

Usually gently rolling lands do not present much of a problem as they have fair natural drainage except in the depressions. Tile drains should be run up the approximate center of these depressions. Where pockets less than 150 feet wide exist, one line of tile through the center, the long way, is sufficient as a rule. Where a pocket exceeds 150 feet in width, it usually requires a seepage drain around each side as well as a drain through the center. For quick drainage of pockets, a surface inlet into the tile is needed at the lowest point in the pocket. These surface inlets are made by widening the trench above the tile and refilling with broken tile, old bricks or cobblestones up to a foot from the surface, then covering with coarse gravel or with a pervious soil which does not contain much fine sand.

Flat lands with poor natural drainage require a thorough investigation by a competent drainage engineer in order to design a system with proper spacing and depth of the drains. Tile drain spacing can often be increased 50 per cent when supplemented by surface ridging or by mole drains. The cost will thus be much reduced while the effectiveness will be greatly increased.

Good quality tile should always be used. When buying tile, one should specify that they must meet the specifications for standard drain tile. Anyone may have tests of tile made free of charge by sending a sample (5 tile of each size selected at random), transportation charges prepaid, to the Tile Laboratory, University Farm, St. Paul, Minnesota.

When installing a tile drainage system, the smoothing of the tile trench to the correct grade, and the laying of the tile should always be done by an experienced tiler, while less experienced workmen can do the top spading. Even if the farmer, himself, does most of the trenching, he should employ an experienced tiler to finish the trench and lay the tile, as the system will be useless unless it is properly installed. As a rule, common laborers are not as economical as experienced tilers because they do not work as effectively as experienced men.

Even when experienced tilers are employed the grades on the tile should be checked by an engineer or a man who knows how to run a level before the trench is refilled, and before the tiler is paid. Occasionally, in order to make a large profit, an unscrupulous tiler will not put the tile down as deep as they should go. Several such cases have been exposed by the Division of Agricultural Engineering, but usually too late to save the farmer a big loss. After the tiler has been paid and has left the community, it is hard to find and compel him to relay the tile, but, if his pay is held up, it is easy to get him to relay the tile to proper grade.

Fall is the best time to do the drainage jobs as the rush work is over, the soil is usually in good working condition, the spots in the field that have been drowned out or stunted are still evident, and there is little or no disturbing of the crops.

Not only should new installations be done in the fall, but old ditches, catch basins, inlets and outlets should be cleaned out to be ready for the spring floods. An outlet ditch that has been choked by brush and weeds is an unsightly menace as it holds the water back instead of carrying it away. The outlet ditches should be cleaned out every fall to prevent any water backing up in the tile lines and freezing. There were several cases in this state where the whole tile system was ruined by water backing up from foul outlets into the tile lines and freezing. This loss could have been prevented by a small amount of labor cleaning the outlet.

Not only should the outlet be protected by some type of bulkhead against undermining or caving, but it should also be screened to prevent animals entering the tile.

Roots of willows and other water-loving trees growing in the vicinity of tile drains are likely to enter the drains and obstruct the flow, especially if the tile carries water far into the dry season. Such trees should be grubbed out, or else all tile within 75 feet of them should be bell-ended sewer pipe with the joints tightly cemented with rich cement mortar.

Special Bulletin No. 149, "Farm Drainage Practice," gives a complete discussion on laying out and constructing farm drainage systems. This bulletin may be obtained from the Bulletin Department, University Farm, St. Paul, Minnesota.