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Tile Spacing Results

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Abstract
In 1999, a 45-acre tile spacing project was installed adjacent to the Southeast Research Farm. This was done through donations by local drainage contractors, tile companies, and with assistance from the staff at the Southeast Research Farm. The goal was to compare recommended tile spacing (75 ft) with closer tile spacings.

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Tile Spacing Results

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Introduction

In 1999, a 45-acre tile spacing project was installed adjacent to the Southeast Research Farm. This was done through donations by local drainage contractors, tile companies, and with assistance from the staff at the Southeast Research Farm. The goal was to compare recommended tile spacing (75 ft) with closer tile spacings.

Materials and Methods

Four different tile spacings (30, 45, 60 and 75 ft) plus an undrained control area were installed on 2.5-acre plots, which were replicated four times (Figure 1). The soils in the plot area are Kalona and Taintor soils. All tile lines were trenched at a 4-ft depth.

The field was planted to soybeans in 2000 and the even number years. Corn was planted in 2001 and the odd number years. In the 10 years of the study, 2001, 2003, 2007, 2008, and 2009 had April-June rainfall that was more than 1 in. above the 21-year average.

A concrete manhole was installed to collect tile flow rates and water quality samples coming off the east replication of the plots. Also, shallow ground water monitoring wells were installed midway between two tile lines in each plot. The wells allow the measurement of water table levels throughout the growing season. In 2009, data loggers were installed in one replication to record water table levels on an hourly basis. Water table data is shown in Figure 2 and 3.

In monitoring the water table levels, frequently the undrained control plots had significantly higher water tables than the drained tile plots. The intensive monitoring in 2009 showed closer tile spacings giving a slightly quicker rate of water table drawdown. However, all of the tile spacings had dropped the water table below 1.5 ft in less than 24 hours (Figure 3).

In monitoring flows from the first replication of the tile plots (Figure 4), there is nearly always a higher flow rate from the 30-ft and 60-ft spacing plots than the other two spacings. These plots lay on either side of the "undrained" control plot. This would indicate that the drained plots are taking water from a wider area than initially thought. Therefore, the "undrained" controls may be benefiting somewhat from the tile installed on either side.

Soybean yields showed no difference to only slight differences in yields (2004 and 2008). Of the soybean years, only 2008 had above normal April-June rainfall. However, on corn yields, there was about a 10 to 20 bushels/acre difference between the “undrained” control and the tile drained plots, except for 2005. These yield differences may have been greater if the "undrained" control plots had been more isolated from the tile drained plots. For both corn and soybeans, all of the tile spacing plots had nearly the same yields.

Also, for the corn years, the yields are shown by distance from a tile line (Table 2). The yields are an average of 6 rows (15 ft) harvested. With this harvest pattern, all of the harvest passes on the tiled plots are within 30 ft of a tile line. It seems that there is very little drop in yield until 45 ft (equivalent to a 90-ft tile spacing) or more away from a tile line.

Results and Discussion

In this study on Kalona and Taintor soils, it seems that all drainage spacings gave approximately equal results. This is consistent with the tile spacing recommended in the Iowa Drainage Guide of 80 to 100 ft for tile 48-in. deep on Taintor and Kalona soils.

Table 1. Tile Spacing Yield Results – bushels/acre

Tile Spacing	2000 Beans	2002 Beans	2004 Beans	2006 Beans	2008 Beans
Check-200 ft	47.4	58.1	65.6	51.4	62.1
75 ft	46.5	56.7	66.3	50.5	64.2
60 ft	45.7	55.3	67.1	50.8	62.0
45 ft	45.9	56.6	69.0	50.7	65.4
30 ft	47.1	55.9	65.4	51.1	63.5
Tile Spacing	2001 Corn	2003 Corn	2005 Corn	2007 Corn	2009 Corn
Check-200 ft	169	172	179	170	194
75 ft	179	186	177	192	206
60 ft	177	188	175	189	209
45 ft	178	188	178	192	206
30 ft	176	187	180	192	207

Table 2. Corn yield by distance from tile line (bushels/acre).

Distance from tile line (middle of 6 rows)	2001 Corn	2001 Corn	2001 Corn	2007 Corn	2009 Corn
Over a tile line	179	188	179	192	208
15 feet	177	185	177	191	206
30 feet	175	183	176	192	208
45 feet	164	177	175	181	194
> 45 feet	171	171	177	170	194

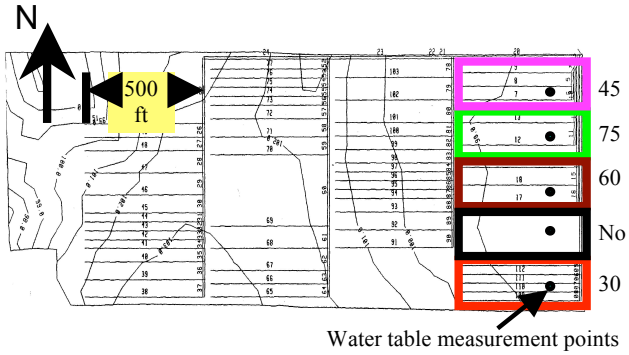

Figure 1. Tile spacing study layout.

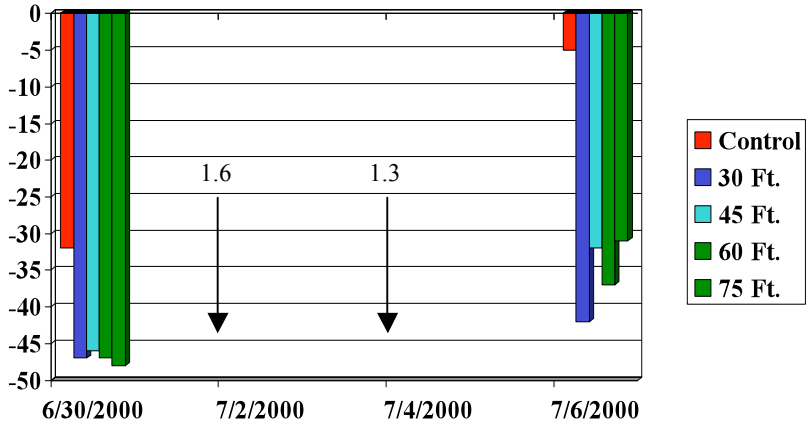

Figure 2. 2000 depth to water table (inches).

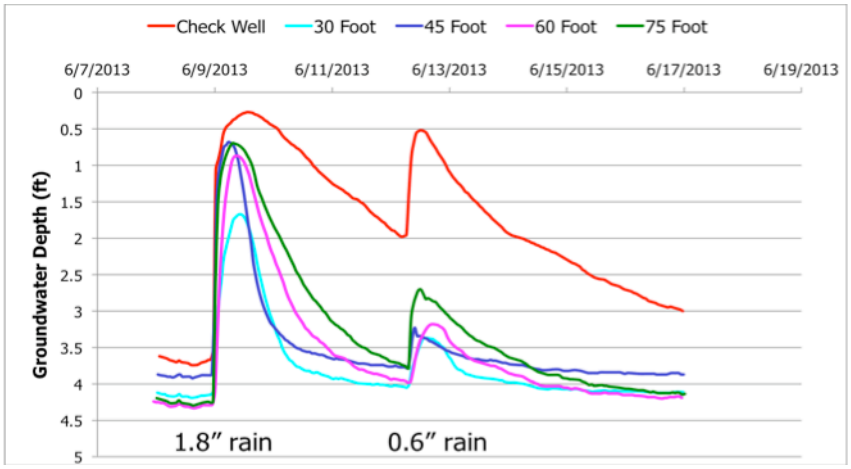

Figure 3. 2009 water table drawdown rates by tile spacing.

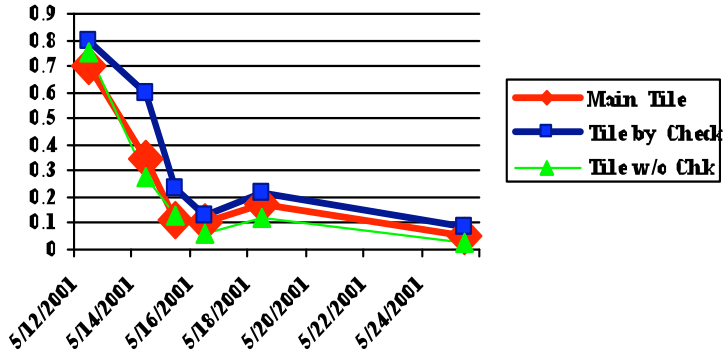

Figure 4. Southeast tile flow rates (inches/day).