

Annual Report for Crop Year 2007

Iowa Contributions to CIG Project

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Introduction

Data collection was ongoing or began at four drainage water management sites in Iowa during 2007. The four sites include:

- Pekin site – nine, 3-acre plots with conventional drainage, controlled drainage, and controlled drainage with the outlet level at 24 inches below the ground surface year-round (pseudo-shallow drainage) [drain spacing = 80 ft., drain depth = 4 ft.]
- Crawfordsville site – eight plots with treatments of conventional drainage, controlled drainage, shallow drainage, and undrained [drain spacing = 60 ft. for conventional and controlled drainage and drain spacing = 40 ft. for shallow drainage, drain depth = 4 ft. for conventional and controlled drainage and drain depth = 2.5 ft. for shallow drainage]
- Story City site – controlled and conventional drainage area [drain spacing = 90 ft. and drain depth = 4 ft.]
- Hamilton County – controlled and conventional drainage [drain spacing = 70 ft. and drain depth = 4 ft.]

The Story City and Pekin sites were established prior to 2007 so full monitoring is available for 2007. The Crawfordsville site was established in 2006 and monitoring equipment was installed in Spring 2007. Due to some flow submergence of the drainage main there were some drainage periods where flow measurements were not accurate but these problems are being addressed to ensure accurate data collection in 2008. The Hamilton County site was established in 2007 and flow monitoring equipment was installed during Spring 2007. Until after harvest in 2007 both the controlled drainage and conventional drainage areas were managed as conventional drainage.

At the four sites subsurface drain flow and nitrate-nitrogen concentrations in the drainage water are being monitored. In addition, precipitation and crop yields are being monitored in addition to agronomic inputs. Within this report we summarize and present annual precipitation, subsurface drain flow volumes, nitrate-nitrogen concentrations, and crop yields. For all systems, except Hamilton County, the controlled drainage areas functioned in conventional drainage mode during the Spring planting and Fall harvest periods.

Precipitation

Overall in 2007 all four sites received above normal precipitation (Table 1)

Table 1. Precipitation in 2007 at drainage water management sites

Site	2007 Precipitation (in)	Deviation from 10-yr average Precipitation (in)
Crawfordsville	40.3	+5.3
Hamilton County	41.3	+6.7
Pekin	43.3	+9.73
Story City	35.4	+3.0

Subsurface Drainage

Annual subsurface drainage volume was reduced in 2007 with drainage water management practices (controlled or shallow drainage) (Table 2). Of note is that both the conventional and controlled drainage areas at the Hamilton County site functioned in conventional drainage mode in 2007.

Table 2. Subsurface drainage in 2007 at the drainage water management sites

Site	Conventional drainage	Controlled drainage	Shallow drainage	Pseudo-shallow drainage
			in	
Crawfordsville ¹	16.2	7.1	7.2	
Hamilton County ²	11.4	11.0		
Pekin	19.2	9.5		5.6
Story City	13.1	10.8		

¹Drainage monitoring from April-December

²Both conventional and controlled drainage areas functioned in conventional drainage mode and monitoring began in May for the controlled drainage area and in August for the conventional drainage area

Note: These data are preliminary and no statistics have been computed for observed differences.

Overall drainage volumes were reduced 18-56% when comparing controlled drainage to conventional drainage. It should be noted that due to lateral flow from controlled drainage to conventional drainage plots at the Pekin site, the conventional drainage flow may be greater than the flow if there was no lateral flow and conversely the controlled drainage flow may be

less than the flow if there was no lateral flow. So, the percent reduction may be a bit high for the Pekin site and the contribution of lateral flow will be evaluated further in 2008. Also, due to flow monitoring problems at the Crawfordsville site due to main submergence the overall drainage from the conventional drainage area may be greater than if no problems had occur. So, this percentage reduction due to shallow or controlled drainage may be higher than what would have occurred with no flow or monitoring problems. These problems with flow submergence are being evaluated to ensure accurate monitoring in 2008. The flow volumes will be analyzed in the future to assess statistical difference between drainage treatments at each site.

Nitrate-nitrogen Concentration

Water samples have been collected at all sites for nitrate-nitrogen concentration analysis. For the Story City site annual flow-weighted nitrate-nitrogen concentrations are presented since complete flow analysis is available (Table 3). For the Pekin, Crawfordsville and Hamilton County sites, arithmetic average nitrate-nitrogen concentrations based on point sample water samples (collected at least weekly) are presented. Ultimately flow-weighted nitrate-nitrogen concentrations will be prepared for the Pekin site for 2007. Overall, there is little difference in nitrate-nitrogen concentration between drainage treatments.

Table 3. Nitrate-nitrogen concentrations in 2007 at the drainage water management sites

Site	Conventional drainage	Controlled drainage	Shallow drainage	Pseudo-shallow drainage
	mg/L			
Crawfordsville ¹	14.5	13.5	15.8	
Hamilton County ¹	11.5	13.7		
Pekin ¹	10.4	10.1		11.9
Story City ²	16.9	15.6		

¹ Arithmetic average and ² Flow-weighted average nitrate-nitrogen concentrations

Note: These data are preliminary and no statistics have been computed for observed differences.

Corn/Soybean Yield

Corn yields were measured at the Pekin, Crawfordsville, and Hamilton County sites (Table 4) and soybean yields were measured at the Story City, Crawfordsville and Pekin sites (Table 5). The plots at Crawfordsville and Pekin are split so half the plot has corn and half has soybean in any given year. Overall there is little yield difference between drainage treatments. Since 2007 was a wetter than normal year based on precipitation it is not unexpected that there would be little yield difference between drainage treatments. The crop yields will be analyzed in the future to assess statistical difference between drainage treatments at each site.

Table 4. Corn yields in 2007 at the drainage water management sites

Site	Conventional drainage	Controlled drainage	Shallow drainage	Pseudo-shallow drainage	Undrained
Corn yield (bu/ac)					
Crawfordsville	178.5	170.6	177.3		167.0
Hamilton County ¹	197.7	194.1			
Pekin	139	142		128	

¹Both conventional and controlled drainage areas functioned in conventional drainage mode
Note: These data are preliminary and no statistics have been computed for observed differences.

Table 5. Soybean yields in 2007 at the drainage water management sites

Site	Conventional drainage	Controlled drainage	Shallow drainage	Pseudo-shallow drainage	Undrained
Soybean yield (bu/ac)					
Crawfordsville	57.8	55.9	51.3		46.7
Pekin	44	46		45	
Story City ¹	58.0	62.8			

¹Average of yield measurements taken approximately every 15 m from control structure starting at 7.8 m from structure out to 147 m from the structure
Note: These data are preliminary and no statistics have been computed for observed differences.

Summary

Precipitation, subsurface drainage, nitrate-nitrogen concentration, and crop yields were measured at four sites as part of the Iowa Contributions to the CIG. For two of these sites monitoring was initiated in 2007. Overall, 2007 had above normal precipitation at all four sites. Subsurface drainage volumes in 2007 indicated some reduction in flow due to drainage water management practices but crop yields and nitrate-nitrogen concentrations were similar between drainage treatments. It should be noted that the results are preliminary and no statistics have been computed for observed differences and further analyses of the data will continue in 2008. Monitoring at these sites will continue in 2008.

Acknowledgments

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of Agriculture and Land Stewardship. The Story City site is primarily supported by the USDA-ARS National Soil Tilth Laboratory. The Crawfordsville site was established through a grant from the Iowa-NRCS and this grant continues to provide some support for this project but the CIG provides additional support. The Hamilton county site was established primarily through support from the Iowa-NRCS through the Prairie Rivers RC&D. The CIG is providing primary support for continued data collection at this site. Support from these organizations provides the opportunity for data collection from a variety of existing sites to further our understanding of the performance of drainage water management in Iowa.