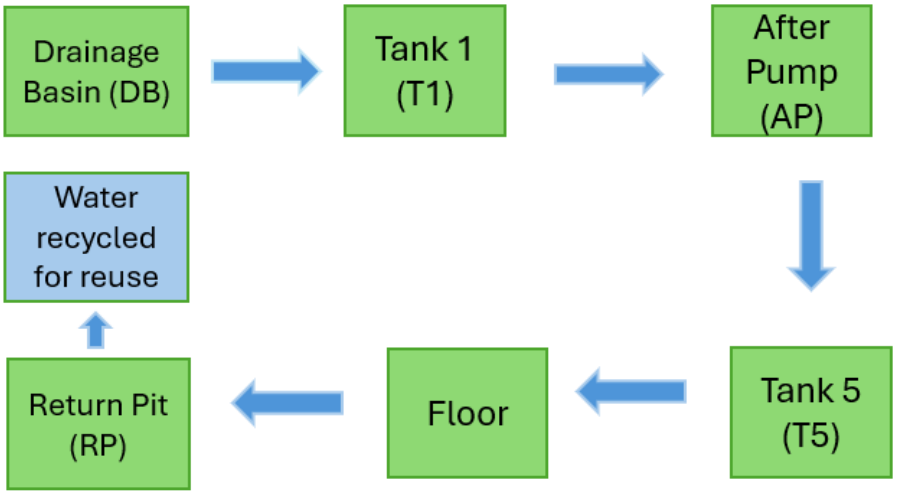
Supplemental Data for:

Under the Sustainable Radar: Tracking metal concentrations and solubility within specialty crop production systems in Ohio

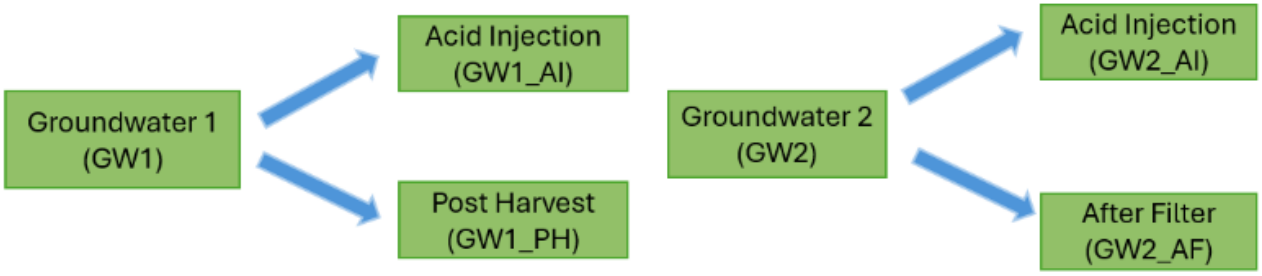
2025 ePLUS Report

System Details:

Farm 1



Farm 2



Results:

A. Farm 1 **B. Farm 2**

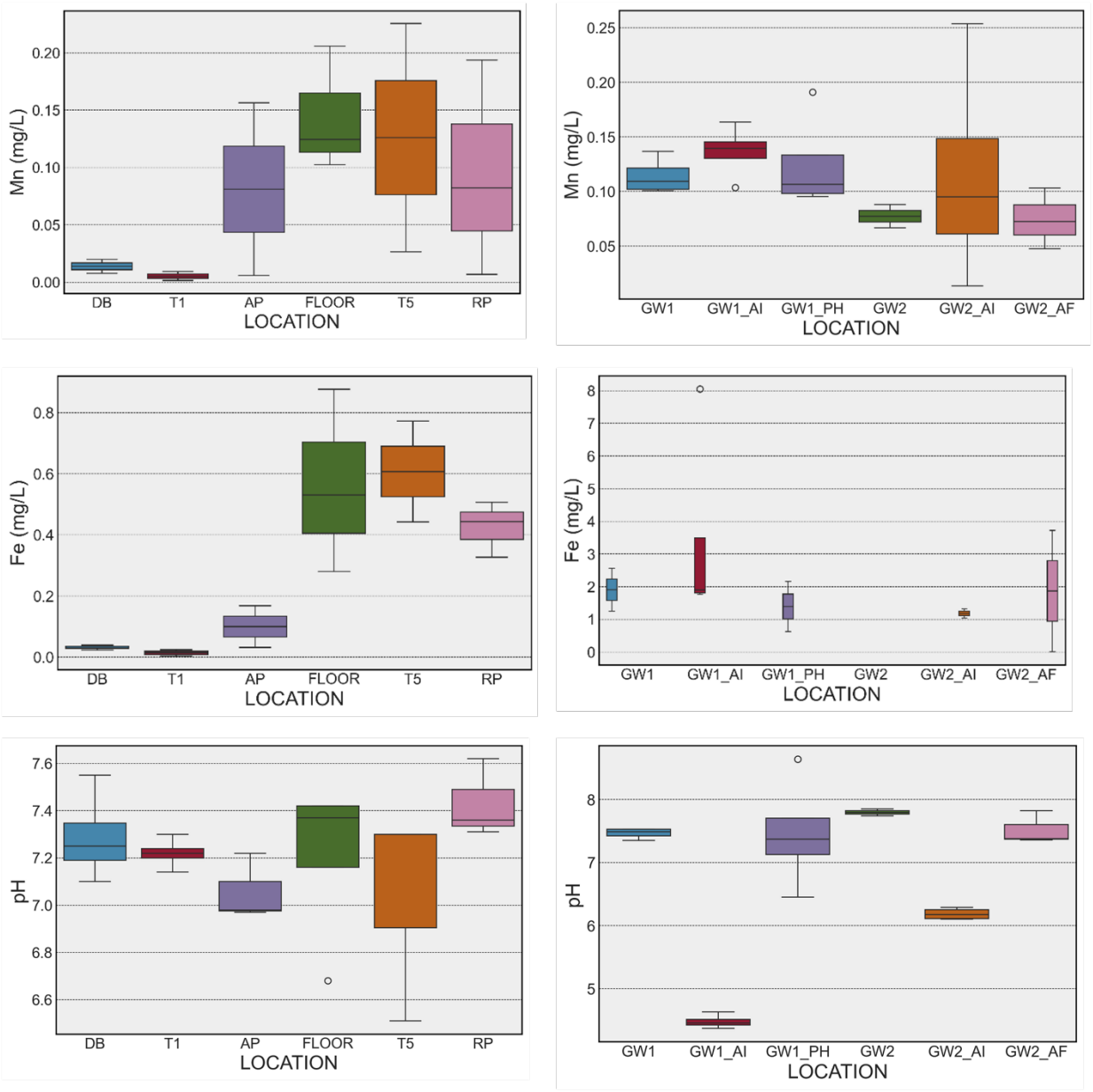


Figure 1- Total Nitrogen (TN), Total Phosphorus (TP), and Total Suspended Solids (TSS) concentrations per farm and sampling location ordered from inlet to outlet across the production system.

At Farm 1, Mn decreased by 0.010mg/L from DB to T1, increased by 0.07 mg/L from T1 to AP, and increased again from AP to Floor by 0.04 mg/L. Mn levels increased significantly from T5 (0.06 mg/l) to Floor (1.2 mg/l), indicating increased metal mobilization in the Floor of the operation (Table 1). . Over the sampling period, Mn showed peaks in early August at the floor and RP and generally trended down towards end of October. At Farm 2, Mn concentrations increased by 0.03 mg/L from GW1 to GW1_AI, then decreased by 0.03 mg/L from GW1_AI to GW1_PH. Median Mn concentrations increased slightly by 0.02 mg/L from GW2 to GW2_AI, but there was a large increase in variability. The highest overall Mn concentrations were at GW1_PH, and peak Mn concentrations were observed at GW2_AI. Mn decreased slightly by 0.02 mg/L from GW2_AI to GW2_AF. Overall, Mn tended to rise after acid injection as decreases in pH influences metal solubility. Over the sampling period, Mn at GW1, GW1_PH, and GW2_AF generally trended downward, while GW2_AI showed the highest values during mid-August. Figure 1 illustrates the variability of Mn levels per sampling location.

At farm 1, Fe concentration decreased by 0.2 mg/ from DB to T1, but significantly increased from T1 to AP by 0.8 mg/L. From AP to T5 and Floor, Fe concentrations decreased by ~0.35 mg/L (Table 1), with larger variation in Floor relative to other points in production (Figure 1). Fe concentrations decreased from T5 to RP by 0.15 mg/L, with a decrease in variation (Figure 1). At farm 2, Fe median concentrations from GW1 to GW1_AI were similar but decreased at GW1_PH. Fe concentrations found in GW1 suggests a metal issue in the groundwater source, likely associated with geology or other factors Fe levels were below detection at GW2, increased again at GW2_AI, and remained elevated at GW2_AF. Over time, Fe increased across sampling points, indicating the importance of this water quality monitoring program.

Levels of pH remained mostly stable, with the lowest median pH being 6.98 at AP. Notably, dissolved metal concentrations mirror pH values, specifically in T5 where there is a wide range of both pH and Mn concentration, and highest overall concentration of Fe. Additionally, median Mn and Fe concentrations remained higher in RP when compared to initial water sources, where concentrations were ~0.06mg/L and ~0.45 mg/L higher respectively. At farm 2, pH decreased at both GW1_AI and GW2_AI following acid injection, showed higher variability at GW1_PH, and remained relatively stable at other sources. Some differences in concentrations of metals could be due to infrastructure (acidic conditions may influence metal corrosive behavior) or differences in water sources.

Table 1 - Farm 1

Sampling Site	Median Mn (mg/L)	Median Fe (mg/L)	Median pH
DB	0.019	0.309	7.22
T1	0.009	0.135	7.22
AP	0.081	0.994	6.98
T5	0.063	0.607	7.30
Floor	0.124	0.531	7.42
RP	0.082	0.443	7.36

Table 2 - Farm 2

Sampling Site	Median Mn (mg/L)	Median Fe (mg/L)	Median pH
GW1	0.109	1.908	7.49

GW1_AI	0.139	1.895	4.46
GW1_PH	0.106	1.394	7.37
GW2	0.077	0.00	7.80
GW2_AI	0.095	1.184	6.18
GW2_AF	0.072	1.866	7.38

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