



## Report for 2022 IDEM Irrigation Trial

### Summary:

This report is prepared for IDEM Irrigation LLC., who has contracted the Irrigation Program at University of Nebraska Lincoln Panhandle Research and Extension Center to compare performance of default sprinkler nozzles with the IDEM nozzles using a linear-move sprinkler irrigation system. In general, results showed that IDEM nozzles yield better than default nozzles for corn. The IDEM nozzles was also able to recharge soil water at deeper depths (2 ft and 3 ft). Actual flow rate was not measured and was not in the scope of this trial.

### Brief Description of Methods:

The trial was conducted during 2022 growing season. The irrigation equipment used was a 4-span, linear-drive, and variable rate sprinkler irrigation system. The trial was conducted at span R3 (R1 is located at the west and R4 is located at the east). Half of the sprinkler nozzles on R3 were retrofitted to IDEM nozzles, and they are referred as IDEM\_1. The default nozzle was Senninger LDN nozzles with flow rate of 2.3 GPM. IDEM nozzles were prepared, installed, and adjusted by IDEM irrigation at beginning and also during the growing season. All nozzles had 10-psi pressure regulators. Different irrigation rates were applied by UNL PHREC Irrigation to test the performance of both nozzles at limited and full irrigation rates. The irrigation treatments (rates) were designed as 33%, 66%, and 100% of fully irrigated treatment (FIT), and each treatment was replicated four times. Before each irrigation event, FIT was calculated using the FAO56 method with data from an onsite weather station. FIT was meant to fully satisfy the requirements of crop water use to ensure no water stress would occur. Appendix 1 shows details of the plot layout.

Corn (Dekalb DKC46-36RIB) was planted on 5/16/2022 with population of 32759 seeds per acre on 22-inch rows. Corn was harvested on 11/02/22 with a GPS-yield monitor equipped combine. No fertilizer was added to the plots due to rotation consideration and future research needs. Herbicide program was applied as recommended by UNL but application was delayed and field had moderate weed pressure. Soil moisture probes were installed by Simplot at selective plots in order to compare soil water dynamics between the two types of nozzles.

### Results:

Throughout the season, a total of 25.1" of irrigation was applied for 100% treatment, while a total of 16.8" and 8.6" of irrigation was applied for 66% and 33% treatments, respectively. A total of 3.5" of rain was received during the growing season. Yield result is showing in Figure 1. **It can be seen that the IDEM 1 setup had better yield under limited irrigation treatments (33% and 66%) and full irrigation treatment (100%) than the default nozzle package.**

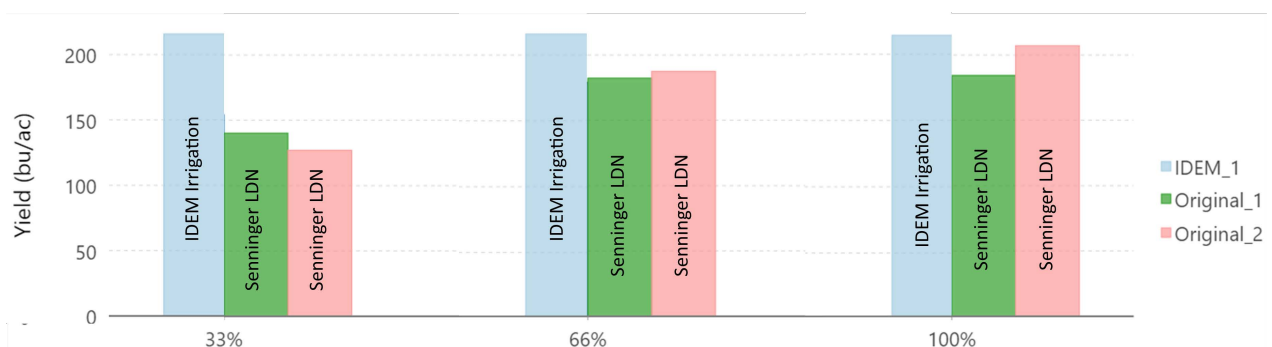
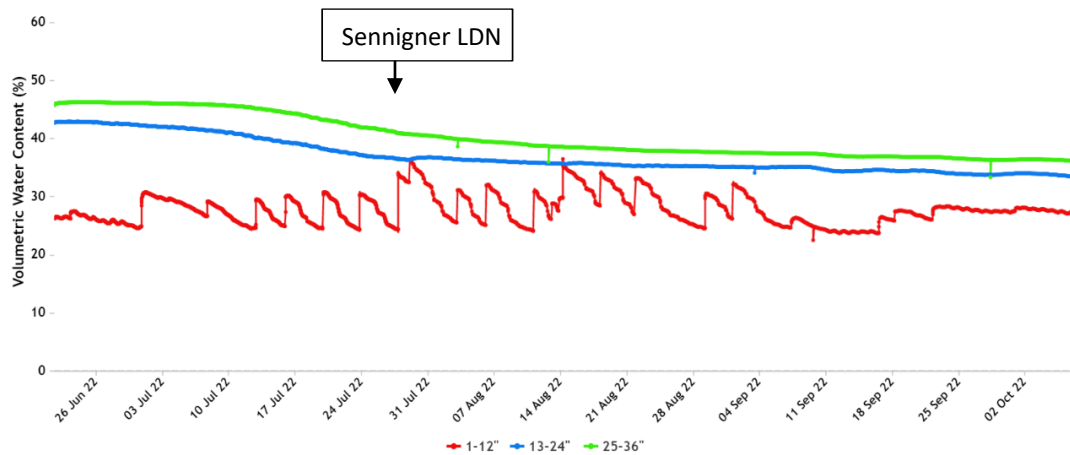
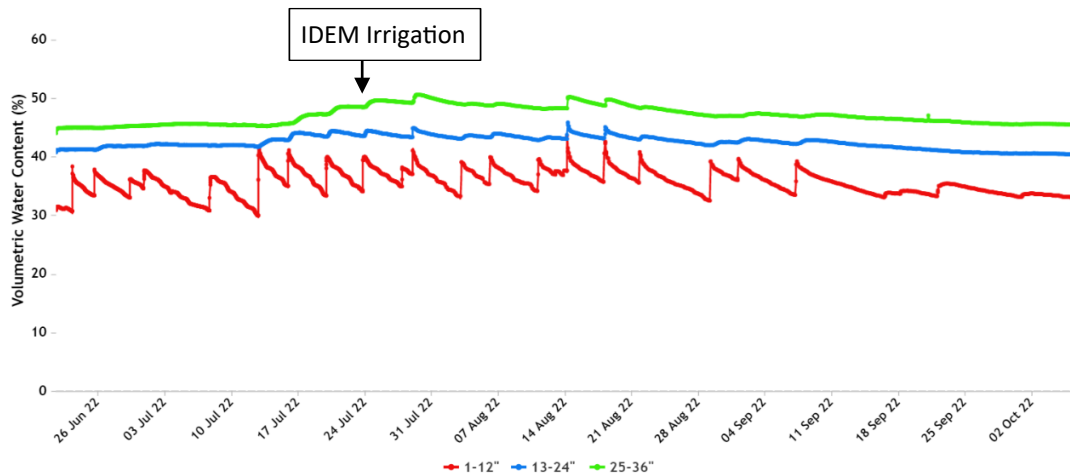


Figure 1 Yield of different nozzle packages under the three irrigation treatments (33%, 66%, and 100%).

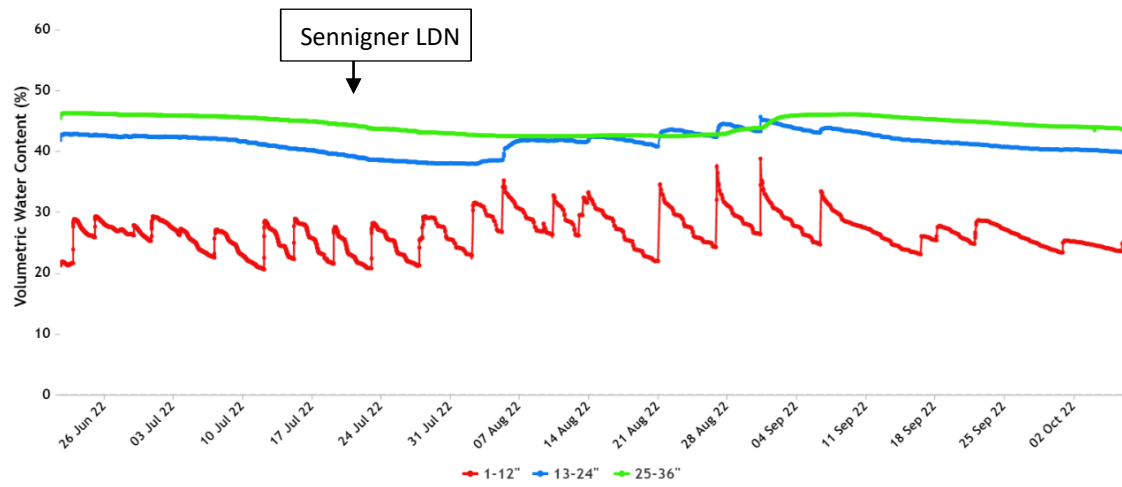
Figure 2 and 3 shows the soil water dynamics under default nozzle packages and IDEM nozzle packages under 33% irrigation treatment, respectively. Figure 4 and 5 shows the soil water dynamics under default nozzle packages and IDEM nozzle packages under 66% irrigation treatment, respectively. Sensor results were aggregated into 1-ft, 2-ft, and 3-ft readings. From the soil water content graphs, it was observed that the IDEM nozzles had infiltrated into deeper depths (2 ft and 3 ft) compared to default nozzles. Take irrigation event on 7/24 as an example, soil volumetric water content (SVWC) under default nozzles had increased from 24.62% to 30.36% at 1 ft depth, and remained constant at 2 ft and 3 ft depths. This equals to 0.69 inches of infiltration into the soil profile  $((30.36\% - 24.62\%) * 12 \text{ inches} = 0.69 \text{ inches})$ . In contrast, SVWC under IDEM nozzles had increased from 34.48%, 43.64%, and 48.52% to 40.05%, 44.48%, and 49.56% at 1 ft, 2 ft, and 3 ft depths, respectively. This equals to 0.67 inches, 0.10 inches, 0.12 inches of infiltration at 1 ft, 2 ft, and 3 ft depths, respectively, and totaled 0.89 inches of infiltration for 3-ft soil profile. Actual flow rates of the IDEM nozzles and default nozzles were not measured.



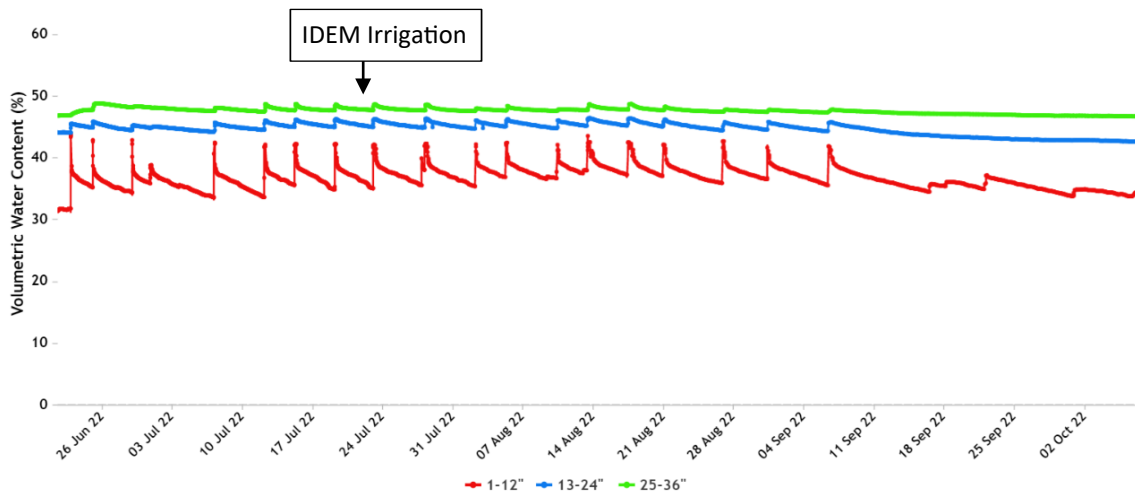
**Figure 2** Soil water content at plot 301D with default nozzles and 33% irrigation treatment.



**Figure 3** Soil water content at plot 304D with IDEM nozzles and 33% irrigation treatment.



**Figure 4** Soil water content at 3011 with default nozzles and **66% irrigation treatment**.



**Figure 5** Soil water content at 3041 with IDEM nozzles and **66% irrigation treatment**.

