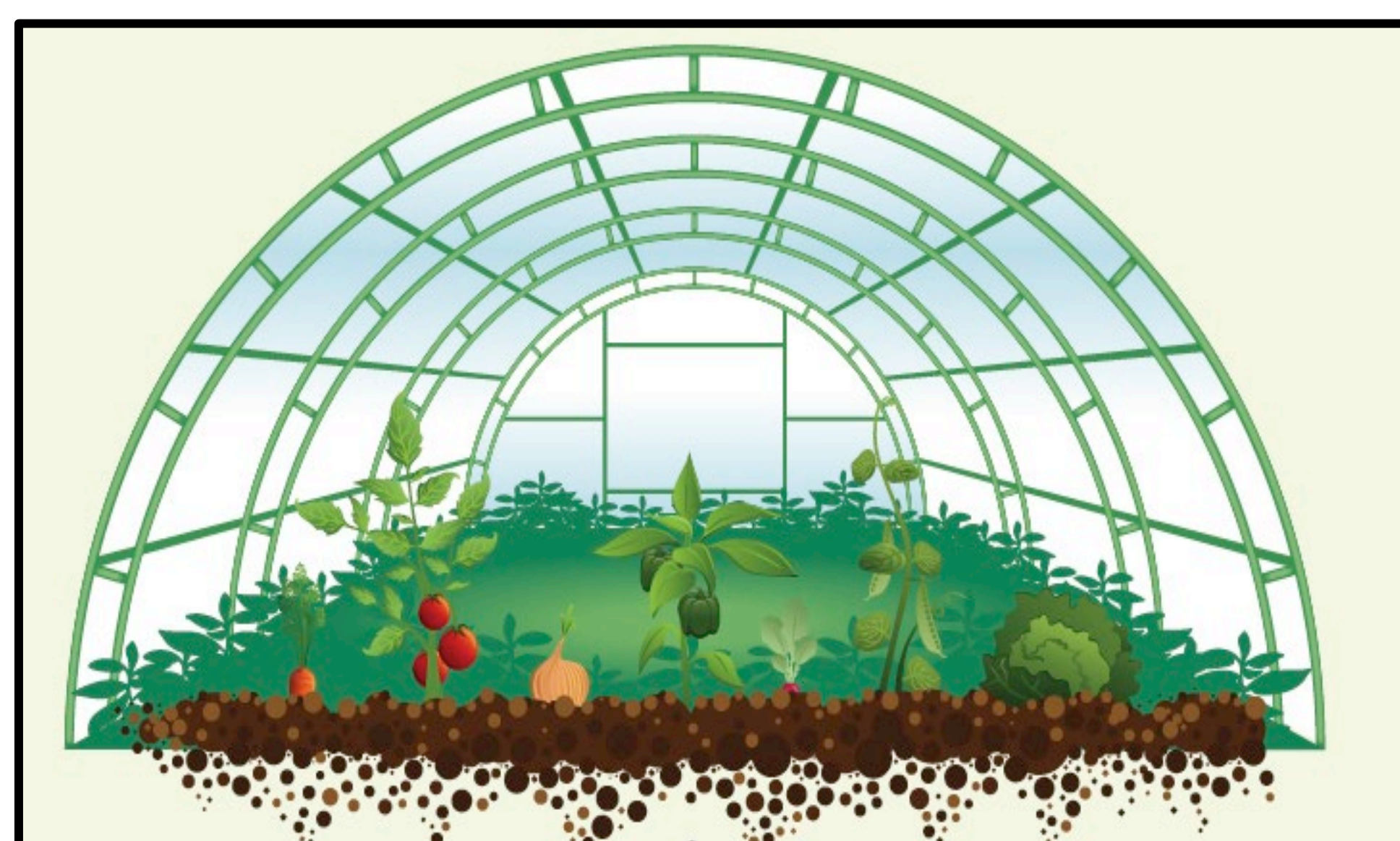


HOW DOES FARM LOCATION IMPACT HIGH TUNNEL GROWING CONDITIONS?

Dr. Samantha Willden and Dr. Laura L. Ingwell

BACKGROUND: The Urban Heat Island Effect can occur in landscapes where density of paved or impermeable surfaces is high. As opposed to natural vegetation that can reduce sun exposure and cool air temperatures, these surfaces, including pavement and buildings, trap and retain heat. Such an effect has been shown in large cities throughout the United States ¹.

Fig. 1. Illustrated example of a high tunnel.

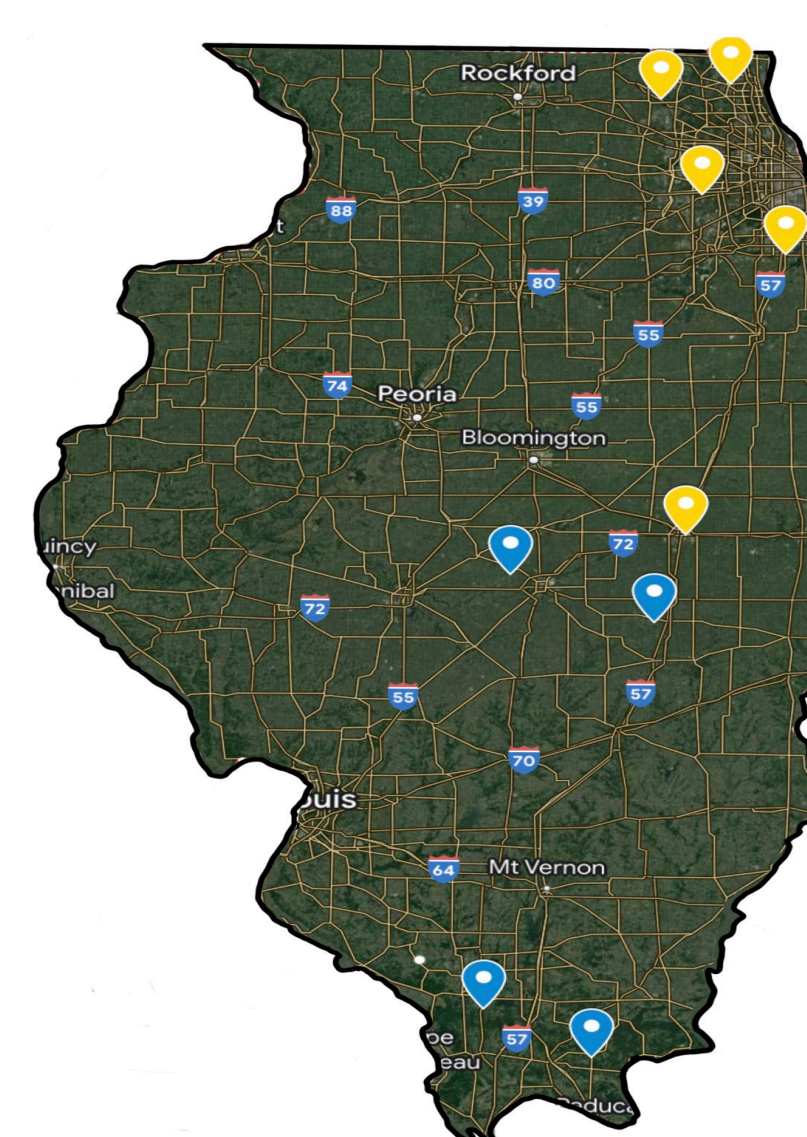


High tunnels can maintain warmer air and soil temperatures compared to the outdoors (Fig. 1). They are often used to extend the growing season early in the spring and late in the fall for specialty crops. High tunnels also provide the opportunity to grow cold-tolerant crops during winter.

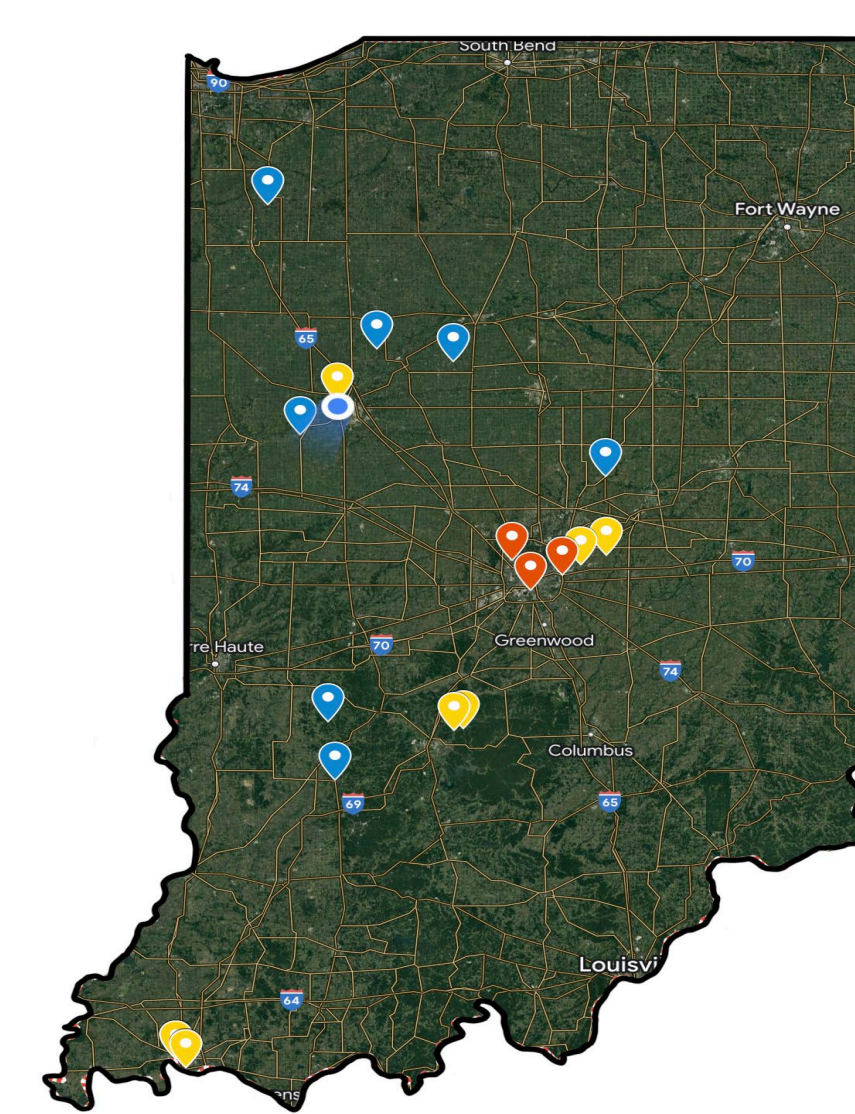
The goal of this study was to determine how growing conditions differ among tunnels present along the rural to urban landscape gradient in the Midwest.

METHODS: 25 high tunnels were chosen at farms across Indiana and Illinois that were present within rural, suburban or urban landscapes (Fig. 2).

Onset[®] Hobo weather stations were deployed within each tunnel to record average air and soil temperature from November 2022 to January 2023 (Fig 3). Outside air temperature was also recorded to serve as a baseline.



Illinois



Indiana

Map legend:



Fig. 2. Map of high tunnels across two U.S. states. Pins demonstrate the location and color the surrounding landscape type.



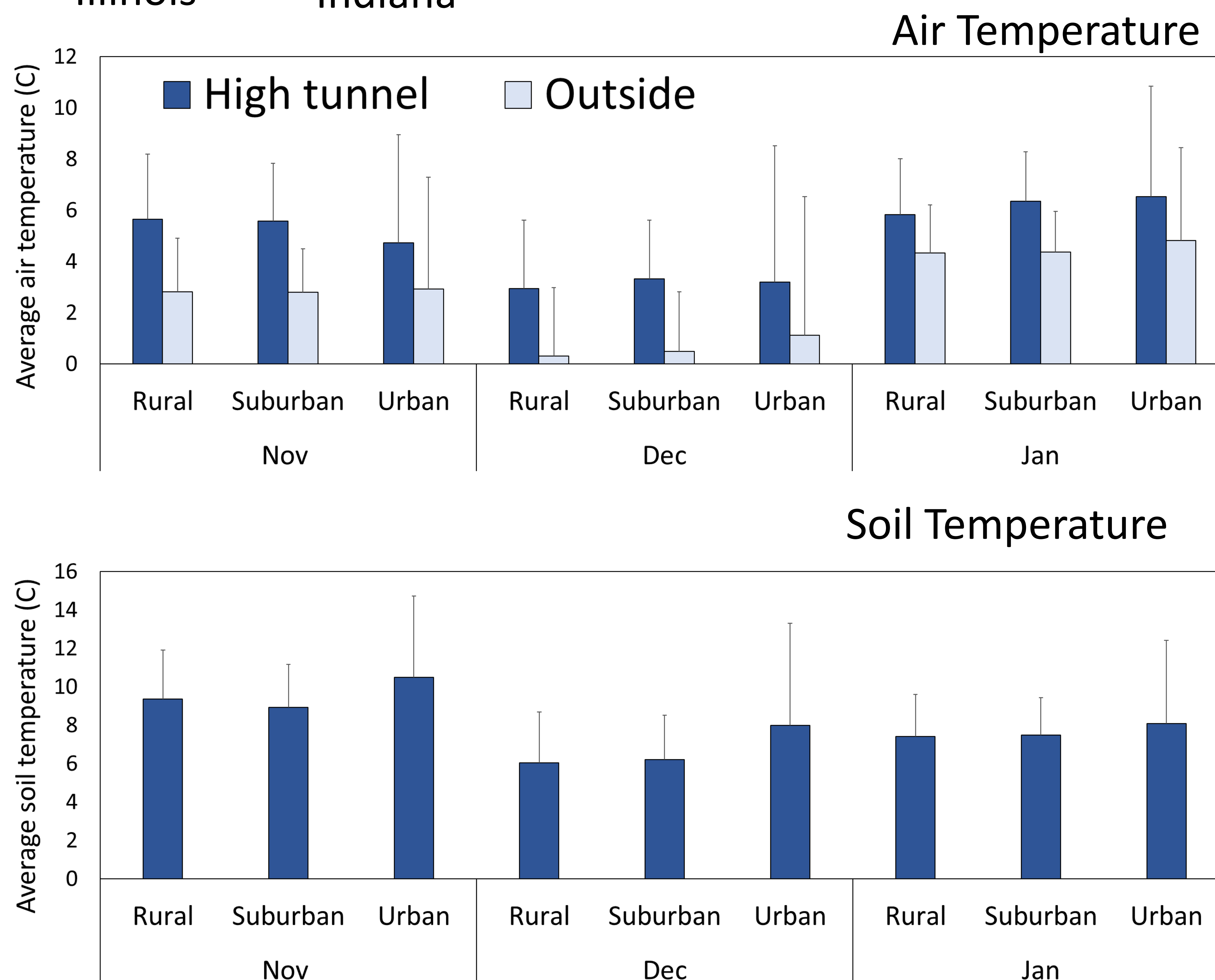
Fig. 3. Hobo weather station.

RESULTS:

Average outside air temp. during Nov 22 and Jan 23 were similar across landscape types. However, during Dec 22, outside temperature at urban sites was noticeably higher compared to suburban and rural sites despite a high degree of variation. There was little difference in air and soil temperature under high tunnels across the landscape types at any time.

Discussion:

This study suggests that the Urban Heat Island Effect is only present during temperature extremes in winter months. In addition, our study found higher temperatures under high tunnels, but not between landscape types. Growers in our study occasionally used supplemental heating which likely explained similar temperatures between high tunnels.



¹ Debbage and Shepherd, 2015. The urban heat island effect and city contiguity.

