

Question: Do current commercial soybean varieties differ in yield response to sulfur and/or potassium with boron fertility?

Introduction

- Potassium (K), boron (B), and sulfur (S) fertility are three nutrient decisions a soybean [*Glycine max* (L.) Merr.] producer will consider to improve grain yields.
- Maximizing productivity of a soybean variety requires correct environmental placement and implementing the appropriate fertility management.

Research Approach

- Commercial soybean varieties from two leading seed brands were evaluated for their yield response to S, K + B, or S+K+B at three Illinois locations in 2025.
- Treatments were replicated 4 times in a split-plot design with variety as the main plot and fertility randomized as sub-plots (two 4.9 m rows with 0.76 m spacing).

Materials and Methods

- **Varieties:** 35 diverse soybean varieties with maturity groups ranging from group 2.1 to 4.3. Eight varieties in common at all sites.
- **Locations:** Three locations, northern IL (41°N), east-central IL (40°N), and southern IL (38°N) (Figure 1), with different levels of inherent soil fertility (Table 1).
- **Sulfur Fertility:** Applied as 5×0 cm surface-dribble (Figure 2) as ammonium thiosulfate (12-0-0-26; ATS) at a rate of 64.5 L ha⁻¹ to supply 22.4 kg S and 10.3 kg N ha⁻¹.
- **Potassium Fertility:** Applied as Aspire (0-0-48-0.5B) using a drop spreader to supply 53.7 kg K and 0.56 kg B ha⁻¹.
- **Grain Yield:** Expressed at 0% moisture.

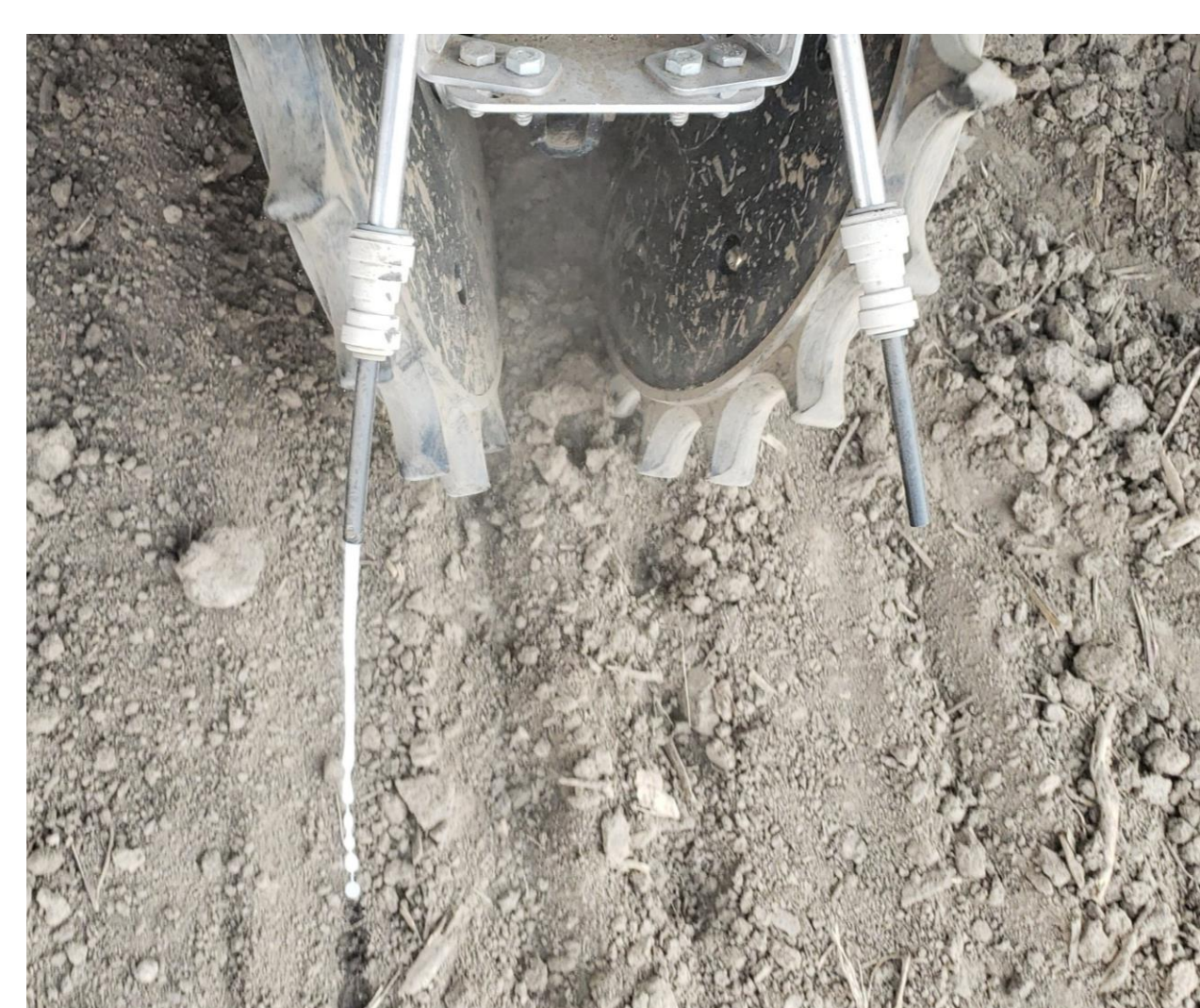
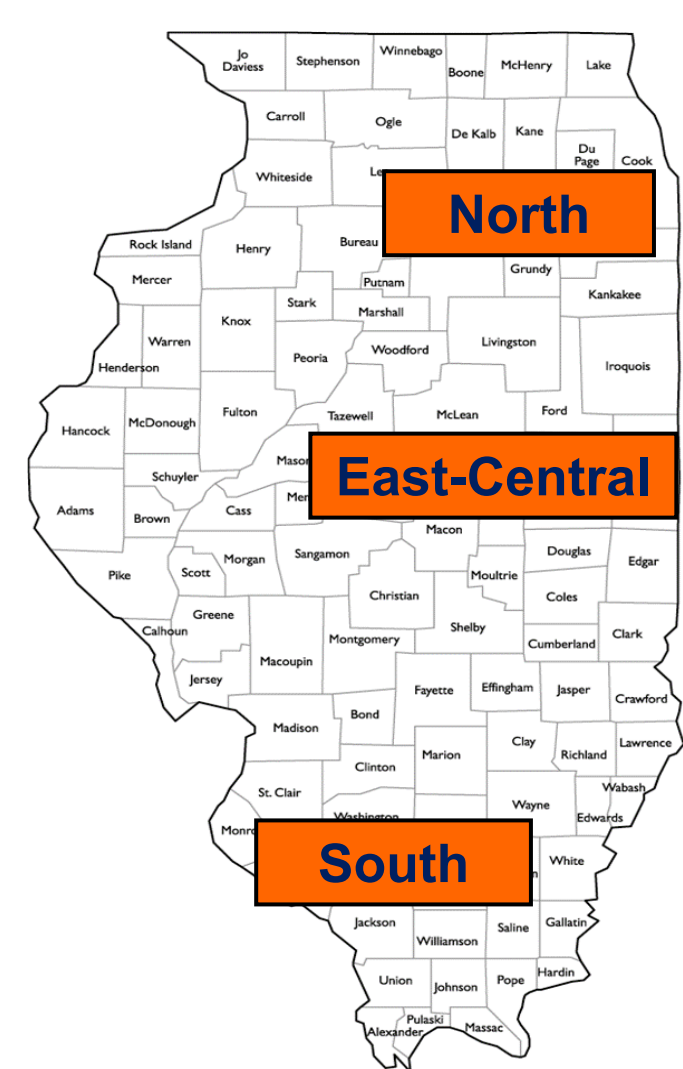


Figure 1. Map of Illinois experiment locations.

Figure 2. The 5×0 cm placement of planter-applied ammonium thiosulfate.

Table 1. Pre-fertility soil test information for each site. Mineral nutrient values obtained with Mehlich-3 extraction.

	Illinois Location		
	North	East-Central	South
SOM (g/kg)	60	32	21
pH	6.7	5.9	6.2
CEC	27.8	16.6	11
K (mg/kg)	113	148	60
S (mg/kg)	9	7	5
B (µg/kg)	15	7	4

Yield Responses to Management

- Location had the greatest effect on grain yield, with site average yields of 4.7 Mg ha⁻¹ (north), 6.4 Mg ha⁻¹ (east-central), and 2.3 Mg ha⁻¹ (south).
- Soybean variety response to S fertility was consistent with soil test levels, where more varieties were responsive in the south (lowest soil S test) with an average response of 55 kg ha⁻¹ ($p = 0.009$), while the number of responsive varieties and the average response to S fertility decreased as S soil tests increased in east-central ($p = 0.880$) and northern Illinois ($p = 0.188$) (Table 1 and Figure 3).
- Similarly, soybean yield response to K+B followed soil test K levels, where southern Illinois exhibited an average yield increase of 35 kg ha⁻¹ ($p = 0.009$), northern Illinois an average increase of 85 kg ha⁻¹ ($p = 0.041$), but with no effect in east-central Illinois ($p = 0.880$).
- There was no additive effect of combining S with K+B at any site.

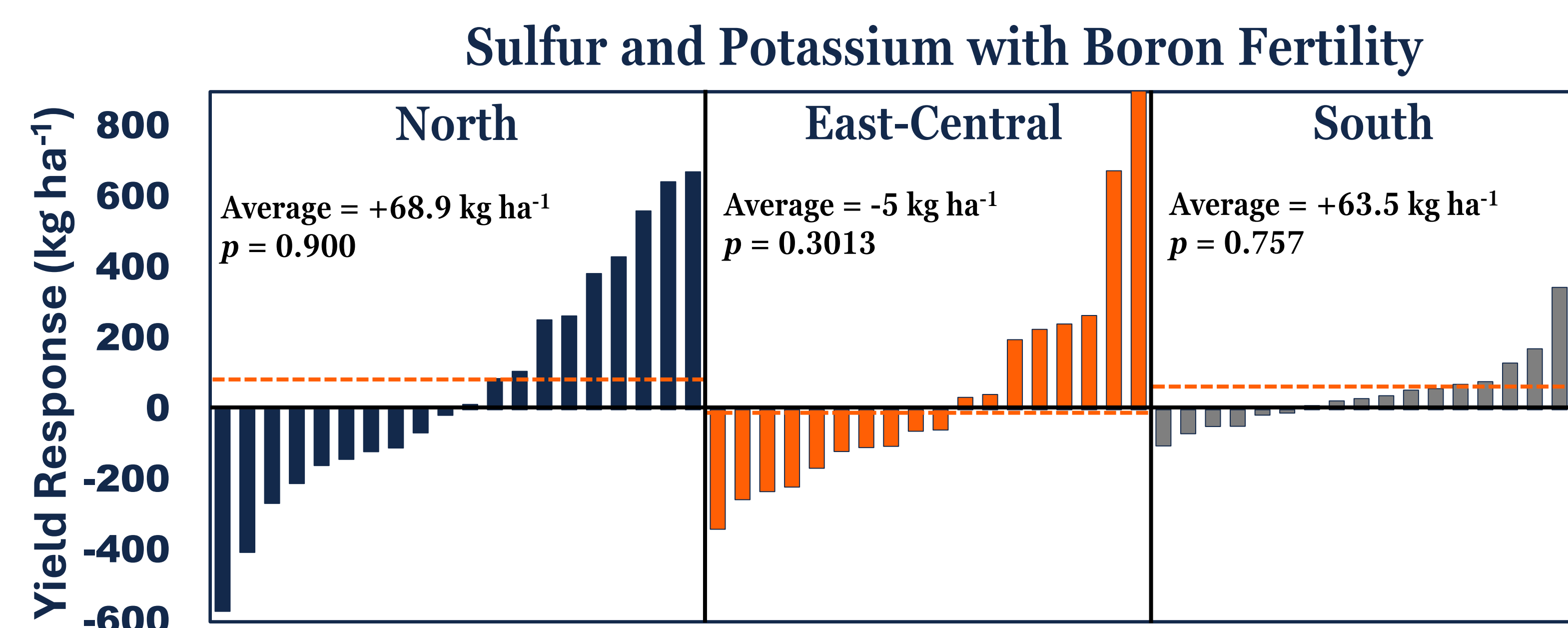
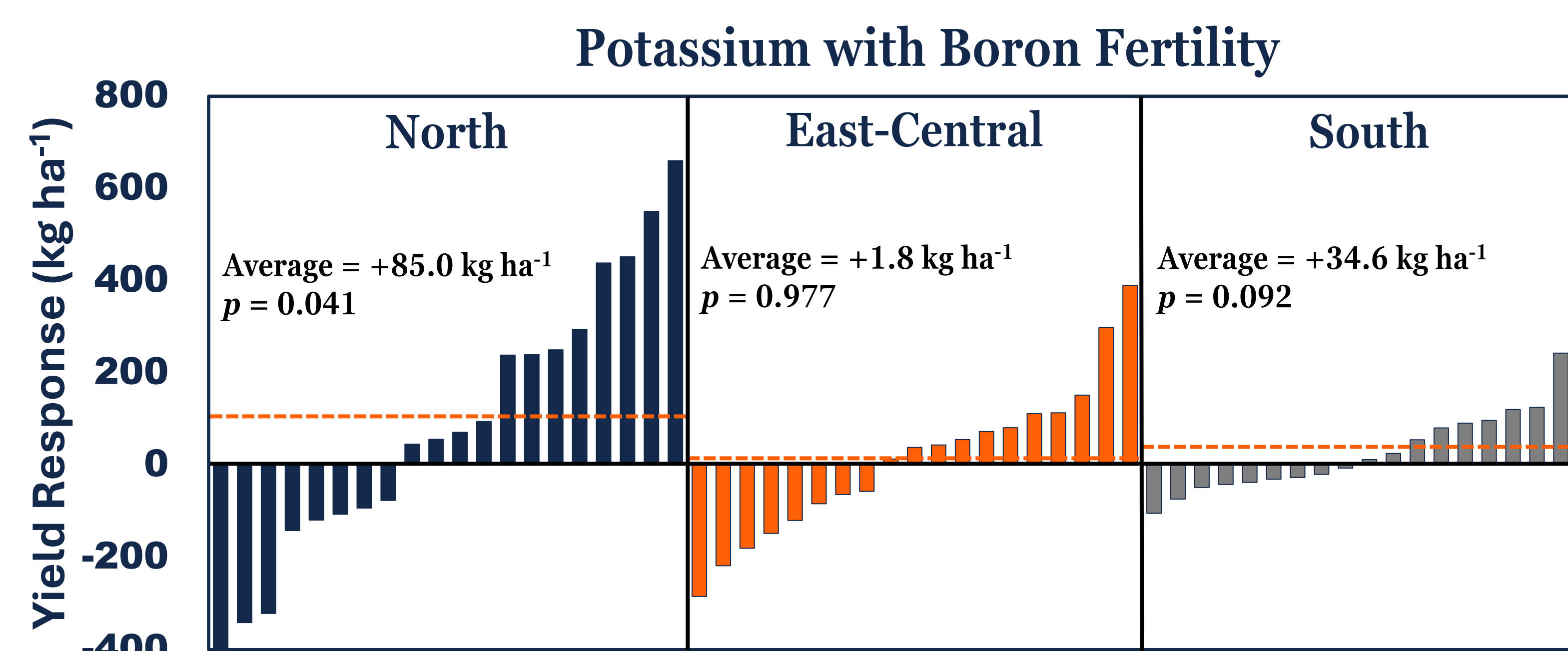
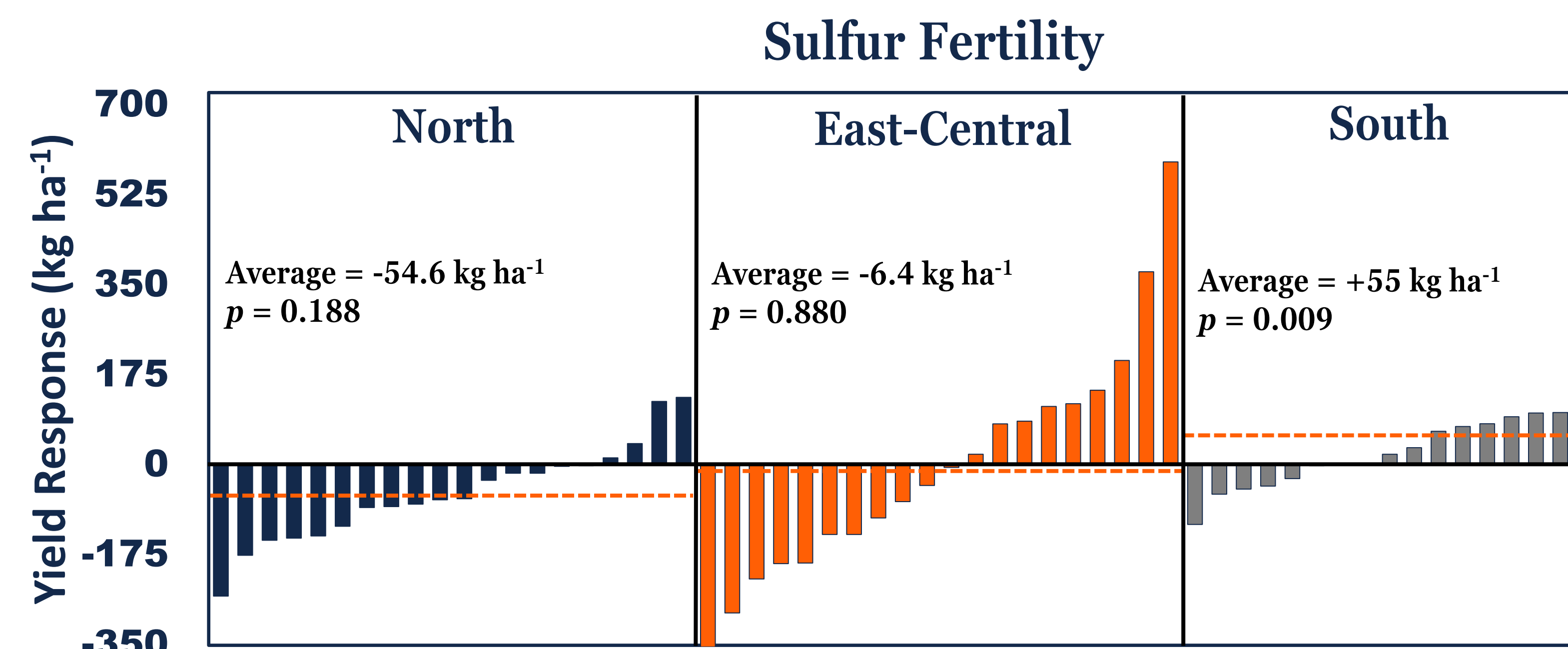


Figure 3. Piano charts displaying variety responses for the main effect of S, main effect of K+B, and the combination of S+K+B fertility supplied at three locations in Illinois in 2025. The orange dashed line represents the response average for a given location.

Variety Characterization

- The eight varieties that were replicated at all three sites, on average, responded differently to fertility (Figure 4).
- They have been categorized by “Unresponsive”, “S Responsive”, “K + B Responsive”, and “Fertility Responsive” meaning both sulfur plus potassium and boron (Table 2).

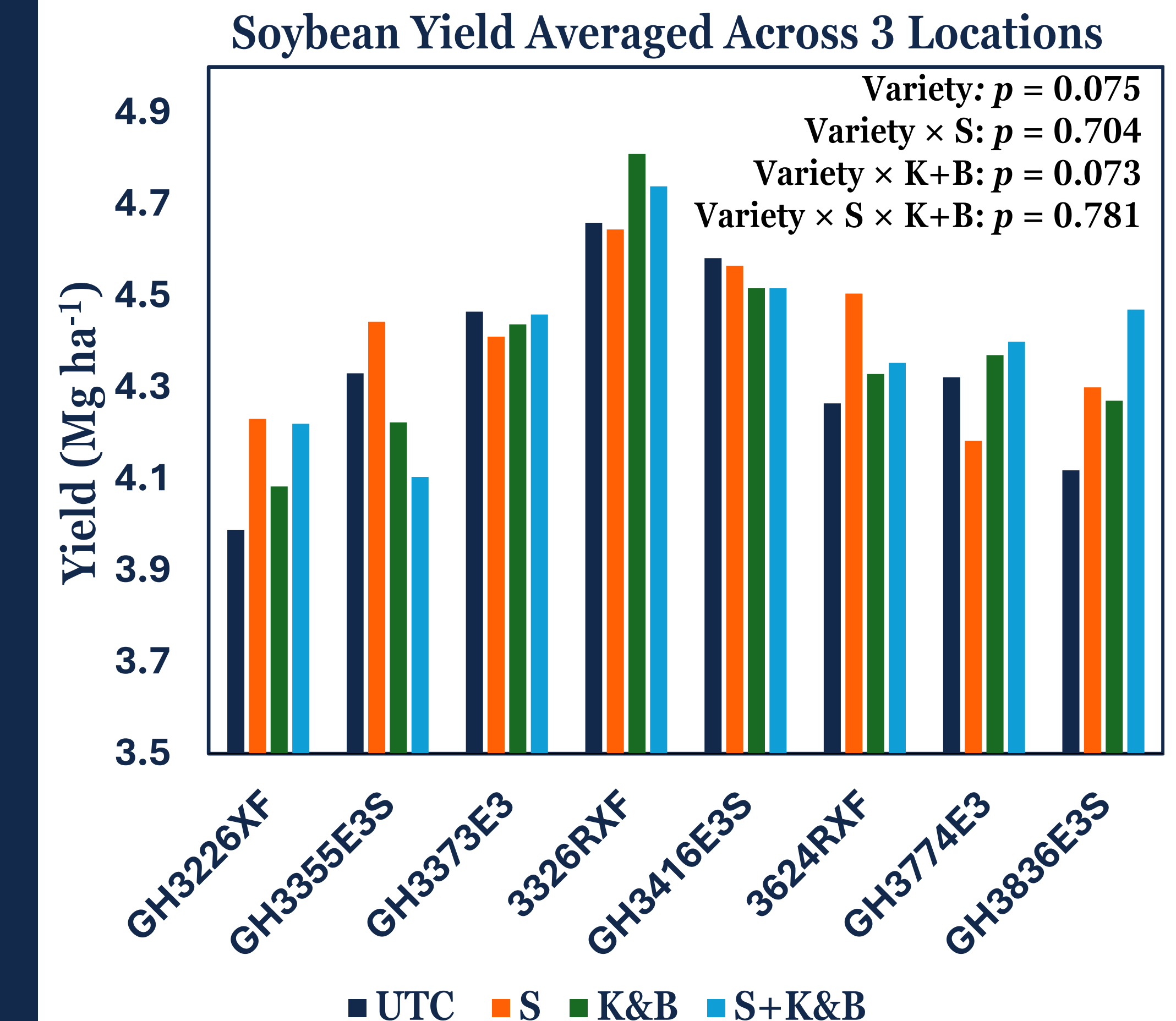


Figure 4. Fertility responses of eight soybean varieties replicated across three locations.

Table 2. Fertility response characterization of each variety.

Variety	Management Characterization
GH3226XF	K+B Responsive
GH3373E3	Unresponsive
3326RXF	K+B Responsive
GH3355E3S	S Responsive
GH3416E3S	Unresponsive
3624RXF	S Responsive
GH3774E3	Unresponsive
GH3836E3S	Fertility Responsive

Takeaways

- Commercial soybean varieties differ in their response to fertility.
- Response to S or K+B was inversely related to initial soil tests, where lower testing sites were more fertility responsive.
- There was no benefit to supplying all three nutrients, and only S or K+B was needed for a given variety planted at a specific environment to achieve maximum grain yield, and some varieties did not require any additional fertility.

Conclusion

Matching variety selection with fertilizer management can maximize productivity.