

## Session B08 – Invited speaker

# Cost-effective agronomic practices could unlock Australian wheat yield potential

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**Abstract:** Australia is a major contributor to the global food supply, accounting for 11% of the global wheat exports. However, Australia's wheat growers are only achieving about half of the water-limited yield potential. Quantifying this yield potential and exploring feasible agronomic practices are essential for closing yield gaps.

Using data from 1,077 wheat National Variety Trials (2015–2023), we parameterized and validated the Agricultural Production Systems sIMulator (APSIM) and defined the genotype  $\times$  environment  $\times$  management (G $\times$ E $\times$ M) dimensions from the same dataset. From this, we applied the APSIM model to systematically simulate wheat responses to G  $\times$  E  $\times$  M combinations over the past 125 years across Australian wheatbelt at 0.05° grid resolution. We then evaluate water-limit yield frontiers, yield gaps, and the contributions of G and M. The objectives of this study were to (1) characterize wheat responses to diverse G $\times$ E $\times$ M interactions in Australia; (2) estimate water-limited yield frontiers and spatiotemporal yield gaps; (3) identify the cost-effective G  $\times$  M combinations that can improve wheat yields and close yield gaps.

Mapping yield frontiers and yield gaps provides a solid knowledge base and clear direction for enhancing the productivity and sustainability of wheat production in Australia. Additionally, this study highlights that closing a substantial portion of Australian wheat yield gaps is possible through cost-effective agronomic practices, without additional time and cost associated with breeding new cultivars or with other agricultural infrastructure or investments.

**Keywords:** APSIM, wheat yield, agronomic practices, yield gaps, evapotranspiration