IWYP International Wheat Yield Partnership

Research to Deliver Wheat for the Future

Traits for increasing wheat grain yield

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Abstract

Crop simulation models combined with field experiments and crop physiology will be used to quantify the impact of traits, the size of a trait change, and trait combinations on wheat grain yield potential. Simulated trait impact scenarios will be created to guide breeding towards the most effective traits and trait combinations for future wheat across the world.

Simulated traits to be investigated will include increased canopy radiation use and radiation use efficiency via increasing carbon capture before flowering, enhancing photosynthetic pathways and specific changes in plant architecture to increase biomass, optimized harvest index, optimizing phenology and deeper and faster root growth to enhance water and nutrient capture

to sustain enhanced biomass growth rates. Crop models will be tested with field data from extreme high-yielding environments from Chile, France, NZ, and the UK. These field data will be used to understand and quantify traits to improve grain yield potential and then applied in simulation studies across global growing environments. To increase the precision of model simulations, the multi-model ensemble platform AgMIP-Wheat will be employed at representative locations and gridded scales covering the entire global wheat-growing area. Uncertainty in trait estimations due to up-scaling point-models to larger areas will be quantified in addition to model uncertainty. The proposed modelling project will estimate the actual region-specific benefits of promising traits to increase yield potential well before an expensive, decades-long breeding effort could achieve this in new cultivar releases. This project will assist breeding towards the most effective traits and trait combinations for future wheat with increased grain yield potential.