

Boosting Yields in Challenging Environments

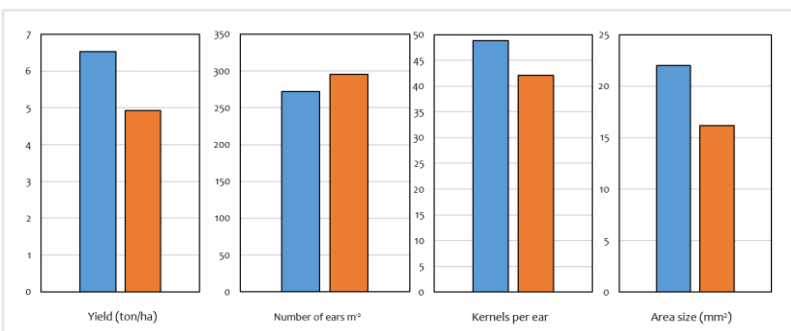
The country of South Africa is a net importer of wheat and is facing a food security crisis with local supply meeting only ~50% of the demand. Therefore, there is an urgent need to increase the average wheat yield per hectare to address their national food security situation and in a sustainable manner. An IWYP Aligned Project “**Chasing Wheat Yields in Challenging Environments**”, led by Annelie Barnard with colleagues at ARC-Small Grain, the Plant Breeding Laboratory of the University of Stellenbosch (SUPBL) and regional seed companies in South Africa, is aiming to rapidly advance wheat yields by applying marker-assisted selection (MAS) techniques for targeted yield component traits and other secondary traits, e.g., quality and aluminum tolerance, to identify higher yielding wheat lines for farmers in South Africa.

What Solutions have been Identified?

- 7 yield component genetic markers, 1 aluminum tolerance genetic marker and 3 grain quality markers were screened on a large diverse set of wheat lines, including those from the IWYP Hub at CIMMYT together with several local varieties. Significant genetic variation for the favorable gene variants for yield components among the lines evaluated was detected. Lines containing the most favorable markers were selected.
- In preliminary field trials under supplementary irrigation, several selected lines averaged 6.52 t/ha which is a 24% yield improvement over the average of the locally grown varieties.
- A second field trial in 2019, under extreme drought conditions, showed that the best performing entries from the panel of 34 lines previously selected using MAS, performed equally well or better than commercial varieties. This suggests that higher yielding lines selected using MAS for the yield component traits and evaluated under optimal conditions may also yield well under abiotic stress.

What has been Transferred to the Wheat Improvement Pipelines?

- Twelve selected lines from the high yielding panel were sent to SeedCo, Zimbabwe for field evaluations
- All MAS and phenotypic data from this program have been sent to the IWYP Hub at CIMMYT and made available to all researchers



Yield and yield component data were compared for the high yielding panel (blue) and locally grown varieties (orange). Although the local cultivars had a higher number of ears per m², yield was significantly higher for the entries. This can be attributed to the size of the kernels and a higher number of kernels per ear.

