

## POSTER SUMMARY

## OPTIMISING THE NUMBER OF TEST SITES, CROP YEARS AND REPLICATIONS TO MAXIMISE POST-RELEASE TESTING EFFICIENCIES

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### Abstract

The objective of this study was to identify the optimal number of testing sites, crop-years and replications needed to maximise efficiency of the post-release evaluation network in the South African sugar industry. Ten commercial sugarcane varieties and one control cultivar were evaluated in randomised block designs in five regions located at KwaZulu-Natal (South Africa). The study was conducted at plant to third ratoon crops across the locations. Data analyses were performed using GenStat® Version 18 and General Linear Model (GLM) to estimate variance components. Genotype x location (GxL) interactions were significant ( $p \leq 0.01$ ) for cane yield, estimated recoverable crystal, sugar yield and fibre. The trait of commercial interest (TERC) was highly influenced by GxL interaction, suggesting that evaluating genotypes across location is essential. Broad sense heritability ( $H^2$ ) was used to model the optimum number of replications, locations and crop cycles required. High broad sense heritability estimates were observed for cane yield (71.17%), estimated recoverable crystal (97.11%) and fibre (93.11%), implying that these traits were genetically controlled. The GxL and GxLxC variances were the largest source of variation in this study. This statement suggested that the evaluation of sugarcane genotypes across locations as opposed to crop cycles would be satisfactory. For TERC (the trait of commercial interest), the resource combination of four replications, five crop cycles and more than ten locations would provide an adequate level of discrimination among sugarcane varieties in the testing network and allow breeders to determine the best yielding and highest quality genotypes across the industry.

*Keywords:* genotype x environment interaction, GEI, broad sense heritability, variance components, discriminating ability