

Optimizing the allocation of trials to sub-regions in crop variety testing

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Abstract

New crop varieties are extensively tested in multi-environment trials to provide a basis for recommendations to farmers. When the target population of environments is large, it is often advantageous to divide it into sub-regions. If the same set of genotypes is tested across all sub-regions, a linear mixed model (LMM) can be fitted with random genotype-within-sub-region effects. The first analytical results on optimizing the allocation of trials to sub-regions were presented in [1] and [2]. In [1] the focus was on single-year experiments. In [2] multi-year experiments were investigated, for which the same allocations of trials (designs) were assumed for all years. In practice, however, the number of genotypes and the total number of locations often vary from year to year. Consequently, it is more realistic to allow different designs in different years. In the present work, a general LMM is considered in which allocations of trial may differ across years. The proposed analytical solution, formulated in terms of design criteria and optimality conditions, enables an easy and fast computation of optimal designs. The obtained results are illustrated using real-data examples.

Keywords

Best linear unbiased predictor, experimental design, linear mixed model, multi-environment trials, optimal design.

Acknowledgements

This work has been funded by the DFG-project 533007746.

References

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