

Optimizing the Allocation of Trials to Sub-Regions in Multi-Environment Crop Variety Testing for Multi-Annual Experiments

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Abstract

New crop varieties are usually evaluated for their performance in a target population of environments (TPE). This evaluation requires conducting randomized field trials at several environments sampled from the TPE. Such trials are called multi-environment trials (MET). If the TPE is large and can be suitably stratified along geographical borders or agro-ecological zonations, it may be advantageous to subdivide the TPE into sub-regions. If the same set of genotypes is tested at a number of locations in each of the sub-regions, a linear mixed model may be fitted with random genotype-within-sub-region effects. The first analytical results to optimizing allocation of trials to sub-regions have been obtained in [1]. That paper considers only a single year of trials. However, in practice the responses are usually being observed during several years. In this work we consider the extended linear mixed model that incorporates the influence of the years. We propose an analytical solution for optimal allocations of trials and illustrate the obtained results by a real data example.

Keywords Target population of environments, Multi-environment trials, Linear mixed model, Prediction, Optimal design

References

- [1] Prus, M. and Piepho, H.-P. (2021). Optimizing the allocation of trials to sub-regions in multi-environment crop variety testing. *Journal of Agricultural, Biological and Environmental Statistics*, 26: 267-288.