

METHODOLOGY FOR JOINT MODELLING OF SPATIAL VARIATION AND COMPETITION EFFECTS IN THE ANALYSIS OF VARIETAL SELECTION TRIALS

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Abstract

Design based methodologies for analysing breeding trials usually fail to fully account for spatial variation and competition effects, leading to poor and unreliable selection decisions. In this thesis, a novel modelling strategy that jointly accounts for spatial and competition effects is developed and evaluated. The proposed approach extends an existing model by relaxing the assumptions about the competition component to allow for more realistic options and to cope with multiple tree plot layout while simultaneously modelling fertility effects.

Autoregressive and cubic spline terms are used to model the competition and fertility effects respectively. Model parameters are estimated based on adjusted profile likelihood. The new model formulation is evaluated through simulation studies against existing methodologies to ascertain its utility. The results indicate the relative superiority of the new methodology in giving efficient and reliable conclusions for both plot and tree level analyses. Difficulties associated with model selection are investigated, discussed and mitigating solutions proposed. The comparative advantage of this model over existing methods is demonstrated using data from Cocoa Research Institute of Ghana.