[O24] Smart Farming (Remote Sensing, ITC)

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Chair: Yoshio Inoue (The University of Tokyo, Japan)
Chair: Sutkhet Nakasathien (Kasetsart University, Thailand)
Chair: Hiroshi Ehara (Nagoya University, Japan)
Fri. Sep 10, 2021 9:45 AM - 11:45 AM Room 2 (Oral) (Farming System)

11:10 AM - 11:25 AM

[O24-06]Development of Robust Spatial Statistical Approach for On-Farm Experimentation

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On-farm experimentation is a means of farmer-centric research and extension that examines the effect of crop management and variety selection on crop productivity in famers' own fields. A recent development in precision agricultural technologies such as yield monitor for combine harvester and variable-rate application technology enables farmers and crop advisors to implement on-farm experimentations easily. However, spatial autocorrelation in a response variable (e.g. crop yield) is frequently observed in on-farm experimentations, which violates the conventional statistical assumption and leads to unreliable inferences. Thus, we developed a REML-based spatial linear mixed model representing the anisotropic spatial variations to account for the underlying spatial structure and to reduce the bias of estimates efficiently. The state-of-art anisotropic model was compared with ordinary least squares (OLS) regression and isotropic spatial model through a simulation study of winter wheat yield in Japan. We further considered the feasibility and precision of different experimental designs. The result demonstrated that the anisotropic model successfully reduced the Type I error rates regardless of experimental designs. Our result further indicated that OLS regression model underestimated the variance of estimates, and the hypothetical treatment effect was outside of the confidence interval. Overall, the anisotropic spatial model was considered to outperform the isotropic spatial model as it could accommodate the actual spatial structure more precisely.