

Spatial variability of soil N, P and K in a paddy field

ABSTRACT

In recent times, one of the major challenges in crop cultivation is the proper interpretation of field maps, which influences the variability of crop yields significantly. The ability to find and comprehend soil factors influencing crop yield variability will enable us to manage the soils efficiently. A study was conducted in a commercial paddy farm at Kahang, Peninsular Malaysia with the objective of quantifying and characterizing the nature of spatial soil nutrients (N, P and K) variation. Soil samples (0-15 cm) were collected at 20 m x 20 m grid pattern from the studied plot (3.85 ha) at the beginning of paddy (MR211 variety) planting and analyzed for total N, available P and exchangeable K. A GeoExplorer II was used to record the soil sampling points and boundary of the plot to interpret the spatial maps in GIS platform with proper coordinates. Geo-statistical analysis was used to characterize the spatial variation of soil nutrients. The coefficient of variation of soil nutrients for the study area was more than 50% where soil P was found to be very high (130%). Semi-variance analysis showed that the sill was reached at 350 m to 450 m (1 to 2 samples ha⁻¹) for soil N, P and K. The kriged soil nutrient (N, P and K) maps showed that a large portion of the area (>90%) in the study plot contained soil N lower than 3 g kg⁻¹, soil P lower than 10 mg kg⁻¹, and soil K more than 0.45 cmol, kg⁻¹. The study indicated that soil analysis and the geo-statistical technique are useful to illustrate the spatial variation and interpretation of soil nutrients with the help of GPS and GIS. This integrated technique is a useful prognostics management tool to enhance site-specific management practices.

Keyword: Grid-sampling; Global positioning system (GPS); Soil nutrients (N, P and K); Semi-variance; Spatial map