

Spatial variability of nitrogen, phosphorus, and potassium using geospatial techniques on black pepper farms

ABSTRACT

Black pepper is mostly planted in Sarawak covering an area of 16,093 ha. The crop is commonly cultivated on hilly topography with poor macronutrients, thus improving farm fertility is necessary. Therefore, the objective of this study was to identify the spatial distribution of N, P, and K at two pepper farms planted in hilly topography. A total of 56 and 52 soil samples (0-20 cm) were taken from SK (Kuching) and NL (Bintulu) farms for pH, N, P and K. The results were statistically analyzed using conceivable correlation and spatial distribution using ordinary Kriging interpolation method to scrutinise the macronutrients distribution in various topography. Finding revealed, SK has exhibited greater P (0.005 g kg⁻¹), while NL possessed greater soil pH (4.95), N (1.33 g kg⁻¹), and K (0.06 g kg⁻¹). Results of coefficient of variation on parameter tested ranged 6.64% to 112.92%, classified them as least, moderate, and most variable. Geostatistical analysis showed SK was best modelled with spherical, exponential, and Gaussian while NL with linear and spherical. A strong spatial dependence was calculated on soil pH, N, and K in SK and P in NL, indicating they were controlled by intrinsic factors. While, the remaining factors in SK and NL were governed by intrinsic and extrinsic factors. Spatial pattern analysis using ordinary Kriging revealed SK lessened N, P, and K contents in steeper area, whereas NL in middle farm. Conclusively, macronutrients availability were affected by topographic, farm management and fertilization application.

Keyword: Black pepper; Extrinsic; Hilly area; Intrinsic; Macronutrients; Ordinary Kriging