Apparent soil electrical conductivity as an indicator of paddy soil productivity

ABSTRACT

Paddy soils are naturally heterogeneous in terms of their physico-chemical properties which influence rice productivity. Currently, uniform application of agricultural fertilizers for the entire field is not efficient and could result in either insufficient or excess nutrient supply. Good agricultural practices can be achieved if soil and nutrient variations within a farm are considered, and a soil-yield interrelationship is established. Simple, rapid and accurate methods to characterize these variations are needed. This study was conducted in MARDI Seberang Perai Research Station located at the northern part of Peninsular Malaysia. Soil samples were collected at regular grid spacing from the upper (0–20 cm) and lower (30–50 cm) soil layers. These samples were analysed for their soil texture and chemical properties. Crop cutting test yields were taken at the same soil sampling locations. Geo-referenced apparent electrical conductivity (ECa) measurements were obtained by using Veris 3100 cart equipped with a data logger and a differential global positioning system (DGPS). The relationship between grain yield and ECa was examined for three crop seasons in scatter plots. A boundary line using log-normal function was fitted to the upper edge of the data in the scatter plots. Significant relationships between potential grain yield and ECa were found with $r^2 > 0.58$. The significant correlations of temporal soil ECa and measurements implied that soil ECa within field do not tend to change significantly over time. Comparison of potential yield (Ypo) and observed yield (Yob) led to classification of farm areas into different management zones and allows for discriminate management practices particularly to low yield areas due to less than ideal field conditions.