

Weena Nilawonk 2009: Estimating Potassium Supplying Power of Selected Maize Soils of Thailand. Doctor of Philosophy (Soils), Major Field: Soil Science, Department of Soil Science. Thesis Advisor: Professor Tasnee Attanandana, Dr.Agr. 96 pages.

Maize is one of the important economic field crops in Thailand. In 2008, a production of approximately 4.3 million tons was harvested from an area of approximately 0.95 million ha and mean maize yield per ha was 4.5 tons. The one hectare of soil may contain several tonnes to several hundred tonnes of non-exchangeable K ( $K_{\text{non-ex}}$ ) that is held in the structure of micas and K feldspars which is differentially available for plant growth. The objective of this study was to quantify the plant available  $K_{\text{non-ex}}$  for intensive maize growing in eight kaolinitic and smectitic maize soils of Thailand. The release patterns and the availability of  $K_{\text{non-ex}}$  was studied using successive the Ca-resin extraction method and described the pattern of release using a segmented regression model. The results indicated that there were two fractions of  $K_{\text{non-ex}}$ , which were released at distinctly different rates as fast and slow release rates. Estimating of plant available  $K_{\text{non-ex}}$  in the soils was obtained using successive maize crops and selected extraction methods. This result indicates that the mixed acid and Ca-resin extraction methods were the most accurate methods to directly extract the total plant extractable K in both kaolinitic and smectitic soils, which included the exchangeable and non-exchangeable K pools in the soils. The mixed acid extraction method was used to determine the plant available  $K_{\text{non-ex}}$  in the Pc and Lb soils at 0-20 cm depth that were exhaustively cropped with maize in the field conditions. The total plant available K of Pc and Lb soils in field experiment were 1,145 and 1,234 kg ha<sup>-1</sup>, and the plant available  $K_{\text{non-ex}}$  was release by different rates, the rapid K release rates of plant available  $K_{\text{non-ex field}}$  were 4.86 and 6.67 kg ha<sup>-1</sup>d<sup>-1</sup>, and slow K release rates were 0 and 0.18 kg ha<sup>-1</sup> d<sup>-1</sup> in Pc and Lb soils, respectively. The K supplying power of Pc soil in field experiment was determined, and approximately 9 years, and the producing yield approximately 3,543 kg ha<sup>-1</sup> for intensive maize growing in Thailand where only 2 crops per year are grown and only grain is removed from the field.

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Thesis Advisor's signature

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