Darakorn Agkhadsri 2009: Sources of Potassium to Plant of Upland Highly Developed Soils under Tropical Monsoonal Environment in Thailand. Master of Science (Soil Science), Major Field: Soil Science, Department of Soil Science. Thesis Advisor: Associate Professor Anchalee Suddhiprakarn, Ph.D. 160 pages.

A study on sources of potassium to plant was carried out on 20 upland highly developed soils under tropical monsoonal environment in Thailand. Topsoil and subsoil samples were collected to study the physical, chemical, mineralogical properties and potassium (K) content. Four forms of potassium; water soluble K, exchangeable K, fixed K and total K were analyzed and combined with greenhouse testing experiment using Guinea grass (*Panicum maximum*). The basal fertilizer except K was applied to plants and the plants were harvested at one month interval until they died or until the sixth harvest. Potassium in plants and soils was then analyzed after cropping.

Results of the study revealed that these soil have loamy sand to clay texture and their bulk density ranges from moderate to high. The soils are extremely to slightly acid (pH 3.7-6.5). They have low fertility indicating highly developed status. They have very low to medium organic matter and total nitrogen. Their available phosphorus varies from very low to high and available potassium ranges from very low to low except for Ao Luk series that has very high available potassium. The sum of extractable bases ranges from medium to high and cation exchange capacity ranges from very low to moderately high. Kaolinite is dominant clay mineral in these soils with minor amount of illite and hydroxyl Al interlayered vermiculite (HIV) and their silt fraction is clearly dominated by quartz.

Guinea grass dry matter yield from greenhouse experiment ranges from 0.04 to 6.05 g pot^{-1} (1 kg soil). The K content in the first cut herbage which is the highest plant uptake period ranges from 2.5 to 32 g kg^{-1}plant and cumulative K uptake ranges from 2.3 to 182 mg kg^{-1}soil. The comparison of soil K between before and after cropping shows the marked decrease in water soluble K and exchangeable K. There is a positive relationship between exchangeable soil K (including water soluble K) and cumulative K uptake by plant with R^2=0.96 and the slope of the linear trend increases progressively up to about one. There is no change in the mineralogical property in all soils except for Chumphon topsoil that the illite/kaolinite ratio decreases. The results also show that potassium in some soils can be completely depleted but it can still exist in some soils due to the continued weathering of their primary and secondary mineral.

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