

Nathaya Ruanpan 2010: Uses of Empirical Models to Study the Effect of Simulated Acid Rain on Nitrogen, Phosphorus and Potassium Availabilities in Soil. Master of Science (Agriculture), Major Field: Soil Science, Department of Soil Science. Thesis Advisor: Associate Professor Kumut Sangkhasila, Ph.D. 83 pages.

Uses of empirical models of effects of simulated acid rains on plant nutrients (nitrogen, phosphorus, and potassium) availability were presented in this thesis. The models consisted of processes involving of plant nutrients mass balances and transformations whose availabilities were controlled by the soil properties namely, soil bulk density (ρ_b), water content (θ_m), soil reaction (pH), content of organic matter (OM) and mass of growing plant (Pt). Values empirical constants of the models were evaluated by using published data related to the effects of simulated acid rains on the availability of N, P, K in Ayuthaya soil series. Time dependent data of total contents of soil nitrogen and organic nitrogen (Org-N) and of contents of ammonium ions (NH_4^+) and nitrate ions (NO_3^-) were used to calibrate N-availability model while time dependent data of available phosphate and soluble potassium contents were used to calibrate the P and K availability models, respectively. The acceptable model constants gave the standardized error and bias (R) with their values lesser than 1.0. Results of the finding constants showed that the higher degree of acid rain severity gave the higher contents of Org-N and NH_4^+ . Interaction of severity degree of acid rain (SDAR) and pH raised the N availability, most in terms of Org-N and NH_4^+ . It reduced the N-availability of NO_3^- form. Interaction of SDAR and ρ_b reduced N-availability of Org-N and NH_4^+ forms. Interaction of SDAR and θ_m reduced N-availability of Org-N and NO_3^- forms. Interactions of SDAR and either OM or Pt increased N-availability of NH_4^+ and NO_3^- forms. Empirical constants of available P model suggested that the interactions of SDAR and either pH or θ_m increased the P-availability in soil, while the interactions of SDAR and either OM or Pt decreased P-availability. The available K model suggested that the interactions of SDAR and either pH or θ_m or OM increased the availability of K, while interaction of SDAR and Pt decreased K availability. Model constants presented in this thesis were highly specific to conditions of obtained experimental data. Model constants should be re-calibrated for the different conditions and situations.

Student's signature

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