

Chutharmard Kaewmano 2009: The Distribution Trends of Salt Affected Soils in Northeast Plateau Basins, Thailand. Doctor of Philosophy (Soil Science), Major Field: Soil Science, Department of Soil Science. Thesis Advisor: Professor Irb Kheoruenromne, Ph.D. 190 pages.

The purposes of the study on the distribution trends of salt affected soils in Northeast Plateau Basins, Thailand were to determine the soil characteristics and distribution and to establish relationships between environmental conditions and the distribution of these soils under a tropical savanna climate. Twenty one salt affected soil profiles were selected from highly to slightly salt affected areas. Methods of study included soil pedon analysis and laboratory analysis of soil samples for their physical, chemical, mineralogical and micromorphological properties. Geographic information system technique as overlaying was used to analyze the distribution trends of salt affected soils and the relationship between these soils and spatial factors.

Results of the study revealed that all soils have moderately to highly developed profiles. They included seventeen saline-sodic Natraqualfs, two sodic Natraqualfs, a saline Endoaqualf and a saline Kandiaqualf. Soils have developed from transported materials as alluvium and/or wash deposits and residuum derived from the weathered salt bearing sedimentary bedrock on low terraces and some of them on erosional plains and floodplain with flat to undulating surface. Characteristics of this residuum layer indicate that it is the main source of salts in these soils. Most soils have mixed mineralogy and kaolinite is the dominant mineral in the clay fraction. Aggregate stability of these salt affected kaolinitic soils measured by the wet sieving method ranges from 3-91 %. The soil property that is most strongly correlated with aggregate stability is pH ($r = -0.84$) followed by exchangeable potassium ($r = +0.75$), cation exchange capacity ($r = +0.73$), clay content ($r = +0.72$), extractable acidity ($r = +0.66$) and organic matter ($r = +0.66$). However, no significant relationships exist between aggregate stability and ESP, SAR or EC. Multivariate stepwise regression analyses indicated that aggregate stability of these mostly saline-sodic soils was well predicted by a combination of soil pH and clay content. The presence of small amounts of smectite and illite may have reduced the stability of the dominantly kaolinitic soil aggregates.

Salt content in the profiles (depth 2 m) ranges from 241 to 3115 ton ha⁻¹. Multivariate stepwise regression analyses indicated that the salt content of these soils was well predicted ($R^2 = 0.73$) by a combination of rainfall, rock type, parent material, surface slope and land use. The high salt contents in the soil profiles mostly occur in the western edge of the basin where shallow residual layer is present with rainfall less than 1100 mm y⁻¹. Rainfall is a major controlling factor for the distribution of these soils on the western rim of the basin which is also controlled by rock structure. The factors that affect the distribution of salt affected soils are high evaporation and land management. Their distribution tends to be widespread in the west of the basin where evaporation is high with the presence of a shallow residual layer towards the northeast of the basin and tends to decrease in the east of the basin where rainfall increases. Salt affected areas are cut off at 1600 mm y⁻¹ of rainfall.

Student's signature

Thesis Advisor's signature

