

Changes of soil properties in the natural forest by different land use patterns
at Sakaerat, Pak Thongchai, Nakornratchasima.

BUNYALID PURIYAKORN.

Thesis. Kasetsart University., 1982.

ABSTRACT

The study was designed to investigate the changes in soil properties under the natural forests, their transformation type of different land use as well as the distribution of biomass and the total nutrients within plant and soil sub-systems at Sakaerat Environmental Research Station. Study sites were randomly selected in two primary forests: Dry Evergreen Forest (DEF) and Dry Dipterocarp Forest (DDF), two cultivating fields: maize field (MF) and cassava field (CF₁), and two abandoned field: 4-year old clearing (OC) and 7-year old clearing (OC₂). The latter two areas represent the result of forest transformation where primary forests have been cleared for crops planting and deserted for a certain period with plant succession has been allowed to be in the natural condition. Maize field and the two abandoned fields used to be under Dry Evergreen Forest while the cassava field was a part of the former Dry Dipterocarp Forest.

Three soil sample pits were randomly dug out in each sample site for soil collection. Three sub-plots of 1 x 1 m.² and 4 x 4 m.² were laid out within the 40 x 40 m² plots of each land use type for studying the composition and biomass of the under growths, the agricultural crops and the standing trees according to their life forms. Plant materials were also collected for nutrient analysis.

Some physical properties of soil under the cultivating fields and abandoned field differ markedly from primary forests. Bulk density and particle density of surface soils under MF, OC₁ and OC₂ sites increase 7-9% and 5-10% respectively as compared to the forest sites but those at lower depth decrease. However, both bulk and particle densities of CF increase 5-9% in all layers. Soil porosity in the cultivating fields and abandoned fields at the depth for 20 cm. and in the deeper layers show an increasing trend being about 3-15% as compared to the forest areas.

Chemical properties of soils also show the same patterns as the physical properties. Chemical properties that suggest some increasing trends in the cultivating fields and abandoned fields are pH, K, Ca, Mg and C.E.C. but they demonstrate in different soil layers. Soils of all land use type in the Sakaerat forest normally show an acid reaction (pH ranges between 4.8-5.7) but slightly increase in all horizons of the cultivating fields and abandoned fields. Surface soil of long period abandoned

field (OC₂) shows a slight reduction in pH approaching to its original forest type while in the sub-soils of all deforested areas are high in pH. The amounts of K and Ca of cultivating field (MF) and abandoned fields (OC₁ and OC₂) increase at all layers of soils but that of CF shows a decreasing trend of K content about 50% at 10 cm. depth. Mg content of soil in the OC₂ site shows an increasing trend in all layers, but in other sites the amount of Mg decreases about 5-30%. C.E.C. of soils increases only under the cultivating field with maize (MF) at all depth intervals, but under other sites it decreases about 2-30%. Decreasing trends of the chemical properties of soils, which are clearly observed in the cultivating fields and abandoned fields are OM, N, P and Fe. All soils of these areas decrease in OM and N contents about 40-50% and P decrease about 17-80% at almost all depths while Fe content decreases about 60-90% from the soil surface down to the depth of 50 cm.

The amount and distribution of biomass and total nutrient are high in the natural forest areas. Biomass of Dry Evergreen Forest and Dry Dipterocarp Forest are accounted for 242.32 and 94.82 ton/ha. respectively. The amount of plant nutrient contained in living and litter layers are about 20% while the other 80% is in the soil. In the abandoned fields which possess the biomass content between 21.12-21.49 ton/ha. contain 5.7% of plant nutrient within plant sub-system while 94.3% of nutrient is in the soil. In maize and cassava fields, living plant is between 3.47-4.00 ton/ha. but the nutrient content is only 1-2% the remaining 98-99% of nutrients in the soil. Almost nutrient contents both in plant and soil are high in Dry Dipterocarp Forest, the cultivating fields and abandoned fields except for Ca and Mg contents which are highest in maize field (2.59 ton/ha.) and cassava field (0.73 ton/ha.) respectively.