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Toposequential Variation in Soil Fertility and Rice Productivity of Rainfed Lowland Paddy Fields in Mini-Watershed (*Nong*) in Northeast Thailand

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Abstract: Mini-watersheds called *Nong* in Thai are geographical components of rainfed lowland rice culture in Northeast Thailand, and constitute distinct units in understanding environmental constraints for low and unstable rainfed rice production there. The toposequential variation of soil fertility and its relation to rice productivity within mini-watersheds, was examined by phytometry of sampled soils and field measurements of rice growth and yield. The phytometry experiment with irrigated potted rice using soils sampled from various rice fields within each mini-watershed, revealed that soil fertility as evaluated by rice dry matter production showed a 5 times difference among the fields at most. The difference in the soil fertility was ascribed primarily to that in nitrogen (N) supply capacity, which itself had a strong correlation with soil organic carbon (SOC) content. Accordingly, the biomass production of pot-grown rice was proportional to SOC content, which suggested the usefulness of SOC as an index for soil fertility evaluation. The effect of clay on the soil fertility was much less than that of SOC. The actual rice yield in each field also showed quite large field-to-field variation, most of which was explained by the SOC content, rice growth duration and fertilizer application rate even though water availability also affected the yield. The yield positively correlated with growth duration and hence with earlier transplanting. Both SOC and clay contents of fields showed steep gradients with

ascending field elevation within mini-watersheds, resulting in a marked toposequential distribution of rice yield. The toposequential distributions of SOC and clay contents imply that rice culture after deforestation accelerated soil erosion from upper to lower fields. The large toposequential gradient in soil fertility requires different resource and crop management for each toposequential position, in order to improve rice productivity of the mini-watershed as a whole.

Keywords: [Clay](#), [Farmer's management](#), [Northeast Thailand](#), [Rainfed rice](#), [Soil fertility](#), [Soil organic carbon](#), [Toposequence](#)

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