Evaluation of salinity effects on rice production in farmers' fields in Ban Phai, Khon Kaen, Thailand

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Northeast Thailand is the major rice producing region in Thailand, but rice yield there is quite low. One of the major causes is salinity, which is derived from underground rock salt and anticipated to increase in the future under climatic change. Salinity lands in Thailand were classified into class 1 (severe) to class 4 (slight) depended on percentage of salt occupation on land surface, but the classification is not associated with crop productivity. Accordingly, field evaluation for assessment of rice production is recommended. This study evaluated salinity condition during rice cropping and its effect on rice growth and yield.

Field investigations were conducted at farmers' fields in Ban Phai district, Khon Kaen provice, Thailand, during September to November in 2017, 2018 and 2019. The fields were classified into class 2 to 4. Leaf area index (LAI) or leaf coverage (LC) was measured every week to evaluate rice growth and rice yield was determined by sampling. Soil EC and moisture were also measured every week and other soil properties suck as organic matter (OM) and exchangeable cations were determined occasionally. Drone images were also taken every week to evaluate spatial variation in rice growth.

Soil EC was significantly higher in severer class, but the clear thresholds between classes were not observed. Difference in precipitation among investigated years (the highest in 2017 and the lowest in 2018) also caused that in average soil EC (the highest in 2018 and lowest in 2017). Although the relation was not consistent, decrease in soil moisture content tended to increase soil EC.

Rice production was also affected by precipitation. The amount of precipitation seemed abundant in 2017, but scarce in 2018. The amount in 2019 was intermediate but some famers gave up planting because the precipitation in the first half of rainy season was quite limited.

The relation between rice yield and soil EC was not obvious, because the yield quite varied even though the EC level was similar. However, the classification of salinity level of USDA based on electrical conductivity of a saturated soil extract (ECe) clearly showed that rice yield was damaged by salinity level. The classification suggested that rice yield was damaged by slightly salinity level of ECe = 2~4 dS/m. The analysis of rice yield in 2018 showed that the primal factor of rice yield was drought and then salinity; that in 2019 showed rice yield was affected by interaction between salinity and OM.
Drone image analysis during dry season for salt occupation and rainy season for rice growth may contribute the evaluation of salinity level for rice production.

Keywords: rice, salinity, drough, electrical conductivity organic matter

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