

Decrease in Rice Production during the Dry Season in a Central Region of Thailand: Linking Water, Paddy Soil, and Rice Properties

SAENGDIAO KHAOKAEW^{1*}, NATTA TAKRATTANASARAN², AND KANJARAT LACHITAVONG², GAUTIER LANDROT³

¹Department of Soil Science, Faculty of Agriculture, Kasetsart University (*correspondence: agrsdk@yahoo.co.th)

²Land Development Department, Phatomtani, Thailand (nattaldd@gmail.com, kanjarat2009@hotmail.com)

³Synchotron SOLEIL, Gif-sur-Yvette, France (gautier.landrot@synchotron.fr)

The rate of rice germination and growth in many agricultural fields of Saraburi Province, Thailand, significantly decreases during the dry season. This nationwide issue, whose sources are not well understood by local farmers, can reduce rice yield by more than 80 percents. Water from local canals is used to irrigate the paddy fields during the dry season. Accordingly, this field scale study carried out in Saraburi Province aimed to characterize and compare between each other the chemical properties of canal water used for agricultural irrigation and those of irrigated paddy soils. A number of irrigation water samples from local canals, wilted rice samples, paddy soil samples from various locations and soil depths (0-150 cm), and surface-soil samples that had a white-crust appearance, were collected during the dry season of 2016. Selected chemical properties of these samples were characterized using multiple analytical methods. The EC of each surface soil sample was lower than 4 mmh_{oc}m⁻¹. However, it increased with soil depth, up to 8.05 mmh_{oc}m⁻¹. The main soluble salts present in soil and water samples were sulfate, chloride, sodium, calcium, and magnesium ions. The SAR in all soil samples and soil depths was lower than 10. Although all paddy soils in the studied area were classified as non-acidic Vertic Endoaquept soils, the pH of all surface soil samples and many subsurface soil samples were lower than 6 and 4.5, respectively. Pyrite was found in soil profiles at soil depths below 100 cm. The total content of Na in the wilted rice was above 2 percents. The ECs and soluble salts in the irrigated water were above their maximum values allowed for agriculture applications. The high soluble salt levels in irrigated water, which may originate from the dissolution of brackish sediments that are abundant underneath the paddy soils, and soil acidity resulting from pyrite oxidation could be major factors inhibiting rice growth and germination.

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