

The effect of salinity on sandy soils physical characteristics and rice root system development: a case study from Northeast Thailand

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Keywords: Sandy soils, saline patches, root development, soil porosity

Abstract

During the last several decades, saline patches have appeared in paddy fields located on sandy soils of Northeast Thailand this being due to capillary rise of underground saline water associated with elevated watertables. This soil salinisation decreases rice production and is a major threat for future agricultural production as these saline patches can spread making paddy fields highly saline. Under extreme saline conditions these saline patches are colonized by halophytes. Since the physical characteristics of sandy soils do not seem to be affected by salinity, research has focused predominantly on changes in chemical characteristics associated with soil degradation. The objective of this study is to determine whether i) salt concentration of the saline patches induces physical degradation in sandy soils and 2) if farmer strategies associated with organic matter spreading improves soil characteristics and root development of rice. In a severely affected area, we selected two neighbouring farm holds that had contrasting organic matter (OM) management strategies implemented during the last decade: OM was never used (OM⁰), differed from the farmer who routinely applied to saline patches (OM⁺). In each of the farmers holding, 4 fields were selected, each field containing one saline patch. In each plot, 3 areas were identified and were the focus of the study: P the middle of the saline patch where rice is unable to grow (bare soil), S at the edge of the saline patch where rice development is restricted and C, the surrounding area not affected by salinity where rice development and yield are considered as adequate. Saline patches have significantly reduced porosity (0-20cm). Reduced porosity is correlated with a drastic reduction in root development both frequency and depth of proliferation. Farmers' strategies associated with OM spreading increased soil porosity and improved root development regardless of any chemical improvement in the soil. Consequently, physical degradation cannot be neglected to characterize saline patches and rehabilitation techniques need to address both chemical and physical issues. The reason for poor plant development within saline patches is still unclear and requires further research. The study demonstrated that despite their low amount of clay, sandy soils are far from 'inert' under saline conditions.

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Management of Tropical Sandy Soils for Sustainable Agriculture



A holistic approach for sustainable development of problem soils in the tropics

27th November - 2nd December 2005
Khon Kaen, Thailand



Proceedings

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ISBN 978-974-7946-96-3

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Under the auspices of:
International Union of Soil Science (IUSS)

organized by:
L'Institut de Recherche pour le Développement (IRD, France)
Land Development Department (LDD, Thailand)

co-organized by:
International Water Management Institute (IWMI)
Food and Agriculture Organization of the United Nations (FAO)
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