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## Potassium Management for Irrigated Lowland Rice on Degraded Soils in the Red River Delta of Vietnam

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### Abstract

The Red River Delta of North Vietnam is among the most densely populated rural areas in the world, averaging 1000 inhabitants per km<sup>2</sup>. Land holdings are small, resulting in highly intensive agricultural practices and the extensive use of external inputs. Three to four crops per annum are cultivated in a single field with rice as the predominant species. The research presented here, focused on degraded soils that occupy about 20 % of the total cultivated area. Low inherent nutrient supply and organic matter contents characterize those soils that developed on old alluvium along the fringes of the Delta. Light soil texture and low nutrient holding capacity call for new approaches in potassium management in order to improve the efficiency of application and consequently the financial return of the cash poor farmers living in the area.

It is current practice that all straw is removed from the field after harvest, resulting in large K exports. Straw is used as animal feed and bedding, as well as fuel for cooking and part is returned to the field as farmyard manure. The sustainability of current fertilizer practices was assessed through nutrient balances in a long-term cropping system experiment. Nutrient availability was measured with resin capsules during the period of highest uptake by rice. Results indicate NPK availability in high to medium range and positive effects of residue incorporation.

It was hypothesized that due to the sandy nature and low CEC of the soils large leaching losses of K are likely to occur. Initial results indicate that a split-application of K results in significant higher rice yields in the wet season. A late K application at flowering tended to improve grain filling and also increased yields. However, during the dry season, when the yield potential is higher than in the wet season, no response to K fertilizer application was observed. The causes for this are currently investigated. It is suggested the K supplied by irrigation water was sufficient to attain the current yield level of 5.5 Mg ha<sup>-1</sup>. Magnesium and micronutrient deficiencies could then be the main yield-limiting factors during the dry season.

**Keywords:** Leaching, maize, nutrient balances, nutrient uptake, *Oryza sativa*, residue incorporation, rice straw, soybean, split application