



Water losses through bunds in paddy rice fields

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In terraced paddy rice landscapes, water losses through earthen banks may significantly reduce irrigation water use efficiency. Water infiltrating into a field's bund either flows horizontally as a surplus to adjacent fields, or percolates vertically towards the groundwater and must be considered as a loss for the irrigation system. The objective of this study was (i) to quantify water fluxes through field bunds, (ii) to differentiate between horizontal and vertical fluxes, and (iii) to identify the predominant flow structure.

The research area is situated in subtropical China. Elevation difference between terraces of the two investigated field sites was 0.5m. Infiltration experiments were conducted on a 1.6 m wide bund segment at different water table depths. Horizontal fluxes were measured as surplus water to the lower field. Tensiometers were installed in the bund as well as in the two neighbouring fields. Brilliant Blue was applied as a dye tracer on two 1.2 m wide segments of the same bund in order to depict the flow pattern.

The infiltration experiments revealed that the fraction of lateral water fluxes increases with the water level. At a ponding depth of 3 cm only 7 % of the infiltrating water reached the lower field, while it was 30 % at water levels of 5 cm and 7 cm. Soil water pressure rose instantaneously in the bund with flooding even at 60 cm below field level, demonstrating the highly dynamic water system of the bunds as compared to the behaviour of the field itself which is dominated by the low permeability of the plough pan. Dye tracer experiments showed that water infiltrated laterally into the bund in cracks, and then moved vertically mainly along biopores. In the bund, a substantial amount of dye reached the groundwater at 100 cm below field level, while no dye was found deeper than 40 cm beneath the field area.

Our results demonstrate that water fluxes through paddy bunds are of major concern

for water management in paddy rice landscapes.