



Extreme anthropogenic erosion: Topsoil Selling in the Mekong Delta and consequences for soil quality

Susanne Weigand (1), Zita Sebesvari (3), Duong Minh Vien (4), Jens Kruse (1), Vo Thi Guong (4), Wulf Amelung (1,2)

(1) INRES - Soil Science, University of Bonn, Germany (susanne.weigand@uni-bonn.de), (2) Agrosphere Institute (IBG-3), Forschungszentrum Jülich, Germany, (3) Institute for Environment and Human Security (UNU-EHS) United Nations University, Bonn, Germany, (4) College of Agriculture and Applied Biological Sciences, Dep. of Soil Science and Land Management, Can Tho University, Vietnam

Increasing urbanization and industrialization leads to increasing demands for construction material, especially in low income countries. For this purpose topsoil is sometimes removed and used as construction material. Topsoil Selling is practiced around the world from America, Europe and Africa to Asia.

In the Mekong Delta, Vietnam farmers physically remove the upper 10-40 cm of their paddy fields and sell it to contractors (= Topsoil Selling, TSS). The excavated material is used for road construction or brick production and therefore the most fertile part of the paddy soil is irrecoverably lost.

The temporal effects of topsoil removal on soil quality are not yet fully understood. We hypothesized that after soil removal, soil quality and yield potential are significantly lower compared to the original topsoil. To test this hypothesis, we sampled two chronosequences in two different provinces of the Mekong Delta. The provinces are Sóc Trăng (Control, 1, 2, 3, 8 years after TSS) and Trà Vinh (Control, 3, 5, 8 years after TSS). The sampling areas differ in texture and cultivation practice: clayey-loamy vs. sandy-loamy and double vs. triple rice cropping. For each year of the chronosequence, 4 field sites were investigated. We sampled the Ap, Bg1, and Bg2 horizon up to 40 cm depth as composite samples from 6 to 8 cores per field.

Soil organic carbon (Corg) stocks at TSS sites were up to 20 t/ha lower than at Control sites (Control: 50 t/ha) in Sóc Trăng and up to 15 t/ha lower in Trà Vinh (Control: 30 t/ha). Especially the Bg horizons revealed a continuous decline in Corg with time after soil removal.

Analysis of available nutrients (Na, K, Ca, Mg, S, Fe, Al, Mn, Zn, Cu) determined by the Mehlich3-Method are still ongoing. Preliminary results, however, suggest that there is not sustainable loss of these elements after selling, but that initial risk of losses are reverted under prolonged management. Phosphorus fractionation according to the Hedley method indicate, however, that easily and moderately plant available P forms are depleted, which has to be accounted for in land-restoration measures.

Overall, the current data we received so far revealed that TSS induces mainly a dramatic loss of soil organic matter. It was ongoing up to the 8th year of our chronosequence; yet, it was not necessarily accompanied by losses in inorganic nutrients. As a result, there is a chance also for the farmers to overcome risks in yield decline because the former subsoils overtake the role of the former topsoils in maintaining rice production.