Complex Terrain and Ecological Heterogeneity (TERRECO): Evaluating Ecosystem Services in Mountainous Landscapes

Soil hydrology under different soil additives in artificial runoff plots

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Introduction:

The impact of monsoon events during June and July in the Korean project region (Haean Basin near to North Korean border in the northeastern part of South Korea) plays a key role for leaching and groundwater pollution risk by agrochemicals. Therefore, the project investigates the main hydrological processes in agricultural soils under field conditions on different scales (plot, hillslope and catchment). Soil hydrological parameters were analysed in runoff plots using different soil additives (Polyacrylamide (PAM), Biochar). These soil additives are known for prevention of soil erosion and nutrient losses as well as increasing of water infiltration, aggregate stability and soil fertility. Soil hydrology in the unsaturated zone on plot scale will be modelled with Hydrus 1D/2D/3D and on catchment scale SWAT (Soil water Assessment Tool).

Methods:

Tensiometers: Tensiometers were installed in upper (4th interrow) and bottom parts (11th interrow) of the runoff-plots in 20, 40 and 60 cm depth in each treatment (PAM, Biochar, PAM + Biochar and Control). Pressure heads were read out daily.

TDR-Sensor ECH2O was used for for measuring water content in the topsoil (5 cm depth) of each treatment row next to tensiometers.

Infiltration capacity was measured by **double ring infiltrometers** for all characteristic horizons.

Water retention curves were analysed in the laboratory by soil cores and ceramic plates for all characteristic horizons.

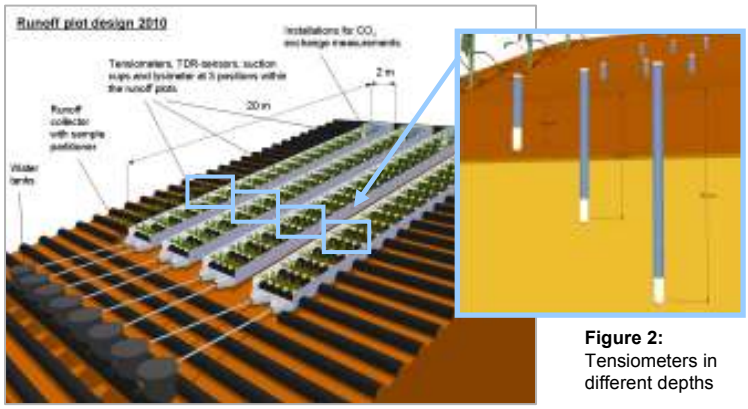

Figure 1: Integrated TERRECO project plots in 2010

Figure 2: Tensiometers in different depths

Prelimenary Results:

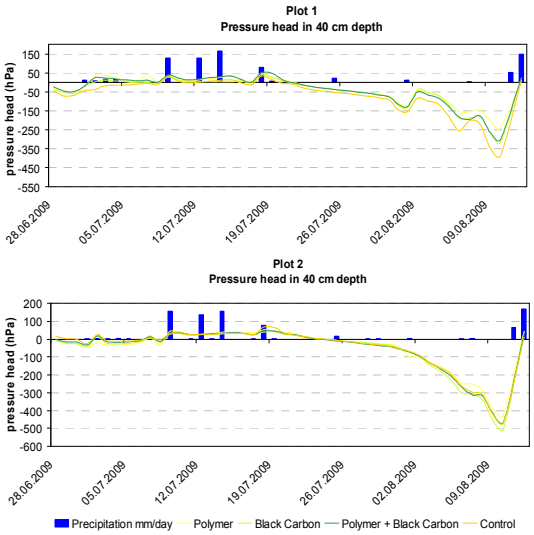

Figure 3: Pressure heads in relation to soil additives

In Figure 4 the pressure heads of three different depths are given. After heavy rain events the soil reaches saturated conditions. As expected, during the dry period top layers dry out more intensively in comparison to the deeper layers. Furthermore, during small rain event (09.08. 2009) only the top layer clearly reacts.

The graphs of the two fieldsites (Figure 3) show only slight differences between the pressure heads measured in PAM, Black Carbon, both PAM and Black Carbon and Control. Differences may be more based on the influence of spatial variabiltiy than on the soil additives.

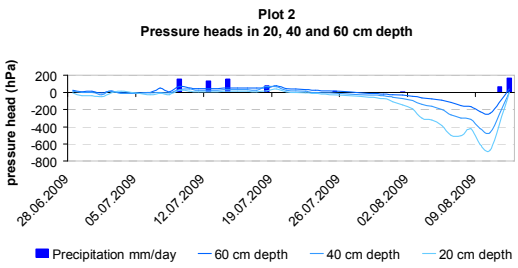

Figure 4: Pressure heads depending on different depth

Outlook for 2010:

- Conceptional sketch is given in Figure 1.
- Intenisively equipped runoff plots will be installed on one fieldsite to study hydro-logical processes in more detail variabilty.
- Preferential flowpathes will be determined by dye tracer experiments using brilliant blue.

Figure 5: Runoff-Plot (Plot 3)

References:
• Glaser, B. (2007): Prehistorically modified soils of Central Amazonia: A model for sustainable agriculture in the twenty-first century, Phil. Trans. R. Soc. B. 362, 187-196
• Sojka, R.E. et al. (1998): Polyacrylamide effects on infiltration in irrigated agriculture, Journal of Soil and Water Conservation, Fourth Quater 1998, Vol.53 No.4