Complex Terrain and Ecological Heterogeneity (TERRECO): Role of weeds on bioproductivity and CO_2 exchange in the agroecosystems in *Haean*-myun Basin of South Korea

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Introduction & Aims:

Intensive studies on weedy-plant species found in the agroecosystems of *Haean*-myun Basin (South Korea) improve our knowledge on the interactions between crops and pest-plants that may have significant bearing on agricultural production. This complex terrain of the mountainous region covers pronounced gradients in geological, topographical and climatic heterogeneity, and thus, hosts greater biodiversity than surrounding lowlands (Becker , al. 2007). Hypotheses:

- abiotic (light conditions, nutrient availability, soil properties) and biotic drivers (inter- and intraspecific competition) influence the dispersal, establishment and distribution of key weed species in the crop fields
- heterogeneous weed communities contribute differently to the overall CO_2 exchange and the bioproductivity of the crops

Methods:

In our study, 32 crop fields (Fig. 1) were chosen because of their spatial distribution in the *Haean* Catchment which is associated with changes in abiotic drivers and leads to differences in the species composition, biomass as well as leaf area development and nutrient availability. Installing 3 net frames per crop field (Fig. 2 a and b) allows mapping of the weed community in three 4m² plots. With this methodology, it is possible to determine species richness and abundance (Fig. 2c), by measuring the percent cover for each species.

The net ecosystem exchange (NEE) and ecosystem respiration (Reco) of crops and weed communities were observed with a systematic rotation over 9 plots using manually-operated, closed light and dark gas exchange chambers (Droesler M. et al. 2005) as it is shown in Figure 3. The set of up to 9 soil frames or collars (Fig. 4) determines the plots and must be inserted into the soil as a base for the chambers. Our plots during a measurement day is a combination of 4 crop plants with different sizes, 3 weed communities and 2 soil plots without any vegetation. After the daily measurements, all the aboveground biomass on each of the plots was harvested to determine the biomass and leaf area within the studied plots. After drying, the nutrient content of crops and weed samples depending on soil conditions will be analyzed in the laboratory.

Conclusion:

The information obtained will be used to design appropriate competition index that will help characterize the different community associations and how they contribute to bioproductivity of both the crops and the weeds. These findings will be integrated into the larger TERRECO project models in order to understand whole ecosystem interactions in the catchment.

References: Becker, A., Körner, C., Brun, J. J., Guisan, A. and Tappeiner, U. (2007) Ecological and Land Use Studies Along Elevational Gradients. Mountain Research and Development 27, 58-65.
Droesler M. (2005) Trace gas exchange of bog ecosystems, southern Germany. Lehrstuhl für Vegetationsökologie. Doctoral Thesis, Technical University of Munich.

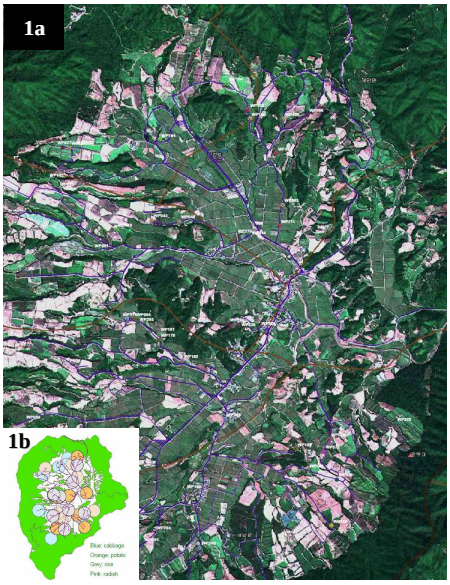

Figure 1: a) Studying area Haean Catchment in South-Korea b) Schemata of the spatial distributed observed crop fields

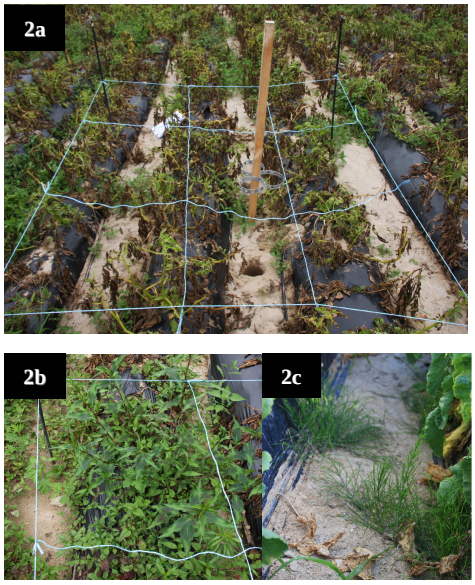

Figure 2: a) Installed net frame for mapping the weed survey b) Shows a subplot of the net frame c) Example for the weed distribution in the inter-row of a potato field

Figure 3: Applied light and dark gas exchange chambers for measuring the NEE and R_{eco}

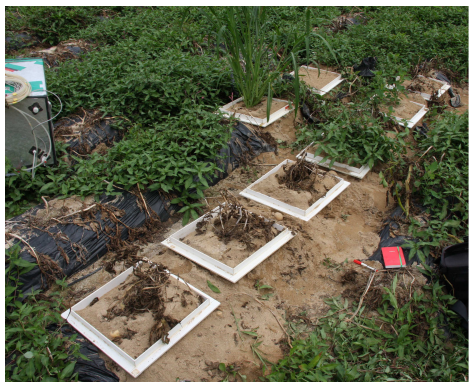

Figure 4: Installed soil frames (38 x 38 cm²) as a base for the gas exchange chambers