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Environment Is Life (EIL): a new local structure to study the influence of abiotic factors on agro-systems functional behavior

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The TERRA Unit of the Gembloux Agro-Bio Tech faculty is building a new research and educational structure with the aim of understanding how the agro-system services (production, GHG mitigation, eco-diversity, soil fertility maintenance,...) will evolved in the future under the influence of climatic change, new technical management mode or land use change. This structure will based first on data collected in an Ecotron able to host 12 closed chambers, each of them containing 2 m^2 of vegetation growing on a lysimeter (1,5m deep). The solar radiation, air temperature and humidity, precipitations and CO_2 concentration could be regulated individually in each chamber to propose different climatic scenarios. Different anthropic technical actions could also be programmed with different timing (fertilization, deep/shallow ploughing,...). The equipment of the chamber will allow monitoring of net fluxes (CO_2, sensible heat, evapotranspiration exchanges and ozone), soil temperature and humidity and chemical composition (DOC, DIC, NO_3-/NH4+) of the soil water and leaching flux. In parallel, biomass production and composition could be evaluated all along the growing season by manual works and chemical analysis. The chambers will be able to be used in different modes (present vs future conditions, one variable gradient, cross-effect of disturbances) to test and isolate the impact of each future perturbation on the biogeochemical cycles of the agro-system. The Ecotron is candidate for integration in the ANAEE network (candidate to be a European Research Infrastructure Consortium) and will be available for development of scientific project coming from outside of the Gembloux Agro-Bio Tech faculty.
For the spatio-temporal extrapolation of the results obtained during the Ecotron experimentations, TERRA Unit will develop a model able, on one hand, to reproduce the outputs of these experimentations (taking into account some particularities of the chamber set up) and on the other hand, to simulate the biogeochemical cycles of an outdoor agro-system plots. The objectives of the model runs will be to translate for natural conditions (real agro-system), the impact of the studied perturbation, with possibilities of divergences in terms of intensity and timing compared to the Ecotron situations
Finally, the structure is completed with an eddy covariance tower site named Lonzée installed in a traditional European temperate agro-system plot and presently part of the ICOS labeling process. The Lonzee site is a cropland (cultivated for more than 75 years) with a 4-year rotation: sugar beet (Beta vulgaris L.), winter wheat (Triticum aestivum L.), potato (Solanum tuberosum L.), winter wheat. The experimental device collect some data similar to those obtained in the Ecotron chambers and will give the opportunity to (i) quantify the actual and real the influence of abiotic factors on ecosystemic services and (ii) validate the model used for the spatio-temporal extrapolation of the Ecotron results.