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Erosion and rainfall erosivity under climate change: rainfall simulation and soil losses measurement at field scale

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Soil and water conservation is a big issue of this century. The soil is a non renewable resource. As we know, the change in climate brings more short erosive rainfall with a high capacity to take away the topsoil. Moreover, topsoil contains all the nutrients the plants needs. It is now essential that we found a new balance between productivity and durability. Impacts of new agricultural techniques on soil structure are already studied in different countries (i.e. Beckers et al., 2010; Walh et al., 2004; Malone et al., 2003). But what are the impacts on erosion? That is a question with few answers. And this is where our experiment comes, in order to link erosion and future erosion with management practices. Two ways exist to act against soil losses: enhancing soil structure or increasing vegetation cover. Our study aims at measuring soil losses and runoff under different practices and for a future scenario of climate change.

This study explores new practices and measures their effects on erosion and runoff under a future rainfall. We focus on two cultures: sugar beet and maize. Each is tested under three different systems. For sugar beet soil structure impact is monitored: three tillage systems are tested: winter ploughing, fall ploughing and fall topsoiling. For maize vegetation cover impact is monitored: three seeding systems are studied: classical seeding (75 cm interrow), classical seeding with Ray-grass seeding in the interrows, and distributed seeding (obtained with a grains seeder).

Rainfall simulation has been chosen for the study so the impacts of climate change can also be tested. A future rainfall was calculated based on a climate change scenario for Belgium (CCI-HYDR project, Willems, 2006-2010). A basic current rainfall of 100 years return period and 30 minutes duration (correspondent intensity: 70 mm/h) entered into the model gives the new rainfall. After the application of the scenario, the new rainfall has an intensity of 80 mm/h. This is our future rainfall used in this experiment.

The simulations of this rainfall were carried on during the main crop season (between June and August). Three simulations were performed on sugar beet and two on maize on plots with the dimensions: 3 m length and 90 cm and 120 cm width respectively for sugar beet and maize (corresponding to two rows of the main culture). During each simulation soil losses and runoff quantities were measured.

From the first year experiment, some tendencies can be observed. The topsoiling on sugar beet culture seems to produce less soil losses when the winter ploughing gives the lower quantities of runoff. The distributed seeding for the maize culture gives the lower rates for both soil losses and runoff quantities.

Our experiment will be repeated at least for the next two years with new future rainfall to be tested. The climatic conditions are an important factor which can modify the behavior of soil response under rainfall event. More research has to be done in order to improve our knowledge of runoff and erosion phenomenon at smaller scale.