Geophysical Research Abstracts
Vol. 15, EGU2013-5556, 2013
EGU General Assembly 2013


# Meteorological risks and impacts on crop production systems in Belgium

Anne Gobin
VITO nv, Environmental Modelling, Mol, Belgium (anne.gobin@vito.be)

Extreme weather events such as droughts, heat stress, rain storms and floods can have devastating effects on cropping systems. The perspective of rising risk-exposure is exacerbated further by projected increases of extreme events with climate change. More limits to aid received for agricultural damage and an overall reduction of direct income support to farmers further impacts farmers' resilience. Based on insurance claims, potatoes and rapeseed are the most vulnerable crops, followed by cereals and sugar beets. Damages due to adverse meteorological events are strongly dependent on crop type, crop stage and soil type. Current knowledge gaps exist in the response of arable crops to the occurrence of extreme events. The degree of temporal overlap between extreme weather events and the sensitive periods of the farming calendar requires a modelling approach to capture the mixture of non-linear interactions between the crop and its environment.
The regional crop model REGCROP (Gobin, 2010) enabled to examine the likely frequency and magnitude of drought, heat stress and waterlogging in relation to the cropping season and crop sensitive stages of six arable crops: winter wheat, winter barley, winter rapeseed, potato, sugar beet and maize. Since crop development is driven by thermal time, crops matured earlier during the warmer 1988–2008 period than during the 1947–1987 period. Drought and heat stress, in particular during the sensitive crop stages, occur at different times in the cropping season and significantly differ between two climatic periods, 1947–1987 and 1988–2008. Soil moisture deficit increases towards harvesting, such that earlier maturing winter crops may avoid drought stress that occurs in late spring and summer. This is reflected in a decrease both in magnitude and frequency of soil moisture deficit around the sensitive stages during the 1988-2008 period when atmospheric drought may be compensated for with soil moisture. The risk of drought spells during the sensitive stages of summer crops increases and may be further aggravated by atmospheric moisture deficits and heat stress. Summer crops may therefore benefit from earlier planting dates and beneficial moisture conditions during early canopy development, but will suffer from increased drought and heat stress during crop maturity. During the harvesting stages, the number of waterlogged days increases in particular for tuber crops.
Physically based crop models assist in understanding the links between different factors causing crop damage. The approach allows for assessing the meteorological impacts on crop growth due to the sensitive stages occurring earlier during the growing season and due to extreme weather events. Though average yields have risen continuously between 1947 and 2008 mainly due to technological advances, there is no evidence that relative tolerance to adverse weather conditions such as atmospheric moisture deficit and temperature extremes has changed.