Selected aspects of climate change impacts on the landscape and agrosystems in the Czech Republic – CASE STUDY

Institute for Agrosystems and Bioclimatology, Mendel University of Agriculture and Forestry Brno, Czech Republic, mirek_trnka@yahoo.com

CASE STUDY 2
Possible Shifts in the Climatic Niche of European Corn Borer

AIM: To develop and evaluate the method of climatic mapping for determination of a climatic niche of European Corn Borer (ECB) under present and expected climate conditions.

METHODOLOGY: The Environmental Change Assessment Model for Ostrinia nubilalis (ECAMON) that can be used in order to determine the extent of a climatic niche of the ECB under present and future climates (Fig. 5) was developed and provisionally programmed using VBA. Performance of the ECAMON was successfully verified using both multiple site data as well as set of 897 field observations from 234 locations during 1961-2000 period (Fig. 6 and Fig. 7). We have found a hump-like relationship between the climatic niche areas (Figs. 6a, 7a) and the extent of actual damage caused by ECB (Figs. 6b, 7b).

Then we focused on the delineation of the 1st generation climatic niche (i.e. area with climatic conditions suitable for complete development of the 1st generation) in 75% of seasons – Fig. 8 and especially the 2nd generation niche (defined as area allowing for complete development cycle in at least 66% of seasons-Fig. 9). The former one is particular important to the growers and the agrosystems as a whole because the second generation occurrence would increase losses to the maize yield and quality and thus would either lead to increase in the amount of insecticides applied or to Bi-hybrids (GM) introduction.

The ECAMON was run at first at 41 representative sites with available daily data sets for 1961-2000 period. The results were then interpolated using polynomial regression with existing, training, and elevation. The same DLM embedded in the GIS Arc Info platform as in the case study 1 was applied to derive the final maps.

We tested 12 climate change scenarios based on 4 GCM (ECHAM4, HadCM3, NCARPCM, CSIRO) and 3 levels of climate system sensitivity in combination with defined SRES scenarios. Analyses were centered around the years 2030, 2050, 2070 and 2090. For each climate change scenario the reference data set was modified by direct modification approach at each station.

RESULTS:

A) Spatial evaluation of the ECAMON performance under present conditions

B) Spatial distribution of the 1st generation

C) Spatial distribution of the 2nd generation

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