ABSTRACT BOOK

SESSION # 37

The Star Sponsors of the Congress:
COWI
DI Confederation of Danish Industry
DONG energy
MAERSK OIL
novozymes Rethink Tomorrow
ROCKWOOL FIRESAFE INSULATION
VELUX
Vestas

P37.33

A modeling framework for assessing adaptation options of Finnish agriculture to climate variability and change

Reimund Rötter(1), HM Kahiluoto(1), H Lehtonen(2), J Aakkula(2), TR Carter(3)
(1) MTT Agrifood Research Finland, Plant Production Research, Mikkeli, Finland
(2) MTT Agrifood Research Finland, Economic Research, Helsinki, Finland
(3) Finnish Environment Institute (SYKE), Global Change Programme, Helsinki, Finland

Background and objectives: Projections from global models of climate in Finland during the 21st century indicate an acceleration of warming at rates greater than the global average and increased mean precipitation. Possible implications of climate variability and change for Finnish agriculture have been documented in various papers and reports (e.g. Carter, 2007). Most studies agree that in spite of all mitigation efforts climate change will take place to a certain extent. Hence, agriculture needs to adapt to better cope with the risks and opportunities resulting from climate change. There is an apparent need for improved methods and tools to assess impacts of climate change and adaptation potential at plot, farm type and catchment/regional levels (CEC, 2007). This requires to conceptually and operationally link biophysical models that enable estimation of climate impacts on, for instance, crop yields, land use and associated environmental impacts (e.g. nitrogen leaching, water use) with farming system and agricultural sector models. Despite of considerable progress in recent years, key issues related to the identification of effective and feasible adaptive management options at different decision levels remain unresolved (Carter et al., 2007). To enable *ex ante* assessment of alternative adaptation strategies for Finnish agriculture at multiple scales, MTT Agrifood Research and partner institutes recently launched a project on Integrated Modeling of AGrifood SystEms (IMAGES). It aims at developing and evaluating different component (economic and biophysical) models and link them in an integrated modeling framework. This paper presents some first results regarding (i) the conceptualization of the integrated modeling framework, and (ii) the development and evaluation of a crop growth simulation component.

Approach and method: The underlying assumption calling for an integrated, multi-scale assessment method is that both biophysical (e.g. climate change) and socio-economic (e.g. markets) drivers will lead to changes in agricultural land use. These land-use changes, at field, farm, and catchment/regional scales, will in turn have impacts on environmental quality, especially on nutrient loading and biodiversity. A conceptual diagram illustrating the various interactions is shown in Fig. 1 – the corresponding modeling framework is coined AGRISIMU. At the crop level several existing tools are being examined on their applicability in AGRISIMU. Crop simulation model WOFOST (Boogaard et al., 1998), was calibrated for Finnish conditions using comprehensive data sets for spring turnip rape and wheat from MTT experimental stations. Thereafter, it was applied with modified crop parameter sets to examine effects on cultivar differences and time of planting under current conditions and three different climate change scenarios. To evaluate the model we compared simulated and observed crop phenology and yields during period 1976-2005 and calculated performance statistics according to Willmott (1981).

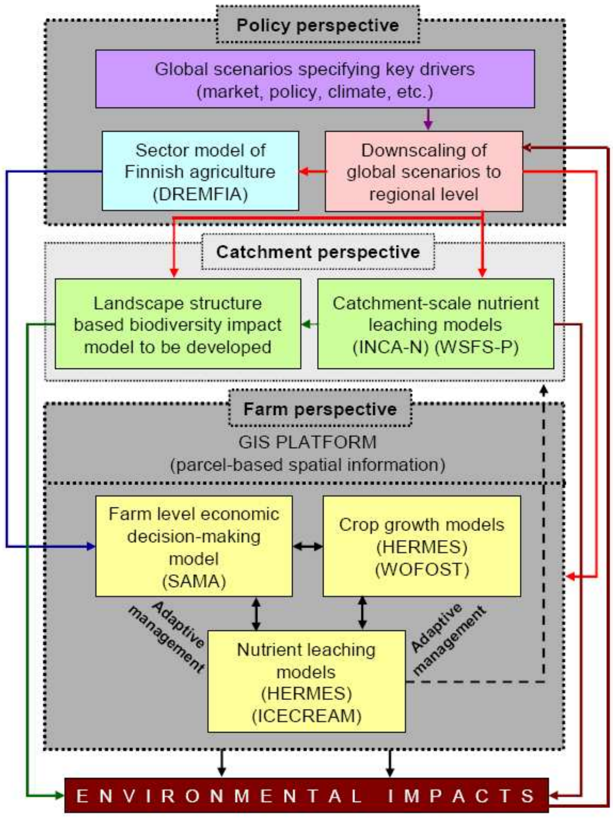

Fig 1. The proposed **AGRISIMU** modeling framework

References

Boogaard, H. L., C.A. van Diepen, R.P. Rötter, J.M. Cabrera, and H.H. van Laar, 1998. User's guide for the WOFOST 7.1 crop growth simulation model and Control Center 1.5, Alterra, Wageningen, The Netherlands, 143 pp. Carter, T.R. 2007 (ed.). Assessing the adaptive capacity of the Finnish environment and society under a changing climate: FINADAPT. Summary for policy makers. Finnish Environment, 1/2007, 76 pp. (in Finnish and English). Smit, B. et al. 2001. Adaptation to climate change in the context of sustainable development and equity. Climate Change 2001: Impacts, Adaptation and Vulnerability. Contribution of the Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change, [McCarthy, J.J. et al., (eds.)], Cambridge University Press, 877-912. Willmott, C.J., 1981. On the validation of models. Physical Geography 2(2): 184-194.