

Projections of climate change impacts on wheat production uncertain: A call for model improvement

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Crop models estimating wheat yields disagree considerably under climate change scenarios. The largest worldwide crop model ensemble study proves that uncertainties in simulated impacts increase with carbon dioxide concentrations and associated warming. It was found that an ensemble model approach currently has advantages over individual crop models when it comes to projections of multiple agroecosystem variables under climate change.

Decision making and planning in agriculture increasingly makes use of various model-based tools, particularly in relation to changing [climate issues](#). Scientist use crop models to explore which parts of the world may face the greatest food shortages under climate change, so that efforts to improve food production can be directed to those places. Wheat, which accounts for 20 percent of calories consumed globally, is one of the world's three most important crops, along with rice and maize.

A large crop model ensemble study was conducted to analyse the effectiveness of 27 wheat models created by top scientists from around the world under both normal and climate change conditions. The researchers found that, if provided with enough information, there are a lot of models that can reproduce experimental data very well under current conditions. But when starting to manipulate the [climate data](#) and [atmospheric carbon dioxide](#) concentrations similarly to how climate change will play out in the next 50 to 100 years, the models started to

disagree more and more.

The results are reported in a study published this month by the journal *Nature Climate Change*. Crop model ensemble of the study revealed the significant uncertainties related to [climate impact](#) simulations on [crop production](#) as anticipated by MTT scientists Rötter, Palosuo and co-authors already two years ago (Rötter et al. 2011 *Nature Climate Change* 1: 175-177 and Palosuo et al. 2011. *European Journal of Agronomy* 35: 103-114).

"The new wheat model intercomparison study is a milestone as it demonstrates the importance of model improvements and adequate reporting of uncertainties related to climate change impact models. Both is essential to be able to provide policy makers with reliable information on adaptation options and food security under climate change," says Reimund Rötter, a research professor of MTT Agrifood Research Finland and one of the key authors of the study.

Simulation models gaining importance as tools for the future

Crop or agro-ecosystem modelling has been pursued also in Finland for decades. Taru Palosuo, a principal research scientist of MTT tells that researchers are now actively working together to improve their models using new data from different areas of the world.

"Changes in climate have boosted the global interest on developing and testing the crop models as models are efficient means to synthesize information. Challenges and opportunities in this field of science are large. We also need to educate new scientists and experts that understand potential and limitations of models and modelling, as well as integration of biophysical and socio-economic models."

More information: Asseng, S. et al. Uncertainty in simulating wheat yields under climate change, *Nature Climate Change*, 3, June 2013. [doi: 10.1038/NCLIMATE1916](https://doi.org/10.1038/NCLIMATE1916)

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