

Developing and Applying Climate Information for Supporting Adaptation in South East Asia

Impact of Projected Climate Change on Rice Production Systems

This case study demonstrates the uses of dynamically downscaled climate model outputs in a rice model to assess climate change impacts on rice production at eight sites in Thailand.

The use of climate services to support climate adaptation in Asia and the Pacific, in particular, is challenged by limited reliable climate information, insufficient capacity to interpret and use of climate information, and limited technical and financial resources.

To address this, the Asian Development Bank supported a technical assistance (TA) project, TA-8359 REG: Regional Climate Projections Consortium and Data Facility for Asia and the Pacific. One of the core activities of this project was to engage in-country project teams to conduct case studies whereby in-country capacities are strengthened through direct involvement in the development and use of climate information in climate impact assessments.

Following the 10-step approach outlined in the guideline (available at www.rccap.org), this case study in Thailand focuses on the development of climate information and its application in an impact assessment on rice production at eight sites in Thailand.

Context

Rice is the major staple food crop of Thai people. There are more than 9 million hectares of rice planted in Thailand. As of December 2016, the value of rice export from Thailand is

approximately 14 times the combined values of exports of rubber, cassava, foods and sugar. Therefore, assessing the impact of projected climate change on rice production in Thailand during the main rice growing season is important for understanding the potential implications of climate change for Thailand.

Results

The downscaled simulations capture the temperature and rainfall patterns across Thailand reasonably well, giving confidence in the projected changes into the future.

Beyond 2005, the projected annual mean maximum temperature shows a definite warming signal, which exceeds the natural variability of the historical period by around 2010 under the high forcing scenario and 2030 under the lower scenario.

The climate projections were used to run a rice crop model to provide estimates of rice production for the period 2006–2040. This was compared to a baseline period (1980–1999).

Most projections give a decrease in rice yields during 2006–2040 relative to the baseline.

Data and Methods

Location

Eight sites throughout Thailand, selected to represent the main rain-fed rice production areas of Thailand as well as the various climatic regions: ChiangRai, Phitsanulok, ChaiNat, SakhonNakhon, UbonRatChaThaNee, Phimai, Prachinburi and Phatthalung

Climate variables

Solar radiation, air temperature (minimum and maximum), rainfall – all daily

Time period

1970–2005 (historical) and 2006–2040 (projections)

Climate data

Data from five global climate models (CCSM4, CNRM-CM5, GFDL-CM3, MPI-ESM-LR, and NorESM1-M) downscaled using CSIRO's Conformal Cubic Atmospheric Model (CCAM)

Outputs from climate model simulations based on two forcing scenarios: RCP4.5 (lower) and RCP8.5 (higher)

Impact modelling

Rice production was modelled using the MWCropDSS model, a standalone desktop shell that links the CSM-CERES-Rice model and attribute and spatial databases, run with the climate model data.

Rice varieties

RD23: representative of non-glutinous, white rice

KDML105: representative of non-glutinous, fragrant or jasmine and photoperiod sensitive rice variety

Niew Sanpatong (NSPT): representative of glutinous photoperiod sensitive rice, commonly grown in the northern region of Thailand.

The full case study report, along with the 10-step guideline, is available on the RCCAP portal at www.rccap.org.

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