Helping to ensure the future of the Mediterranean diet with climate services

M.Terrado, M. Badal, I. Christel, N. González-Reviriego, R. Marcos, B. Solaraju-Murali, A. Soret, F.J. Doblas-Reyes

Earth System Services Group, Earth Sciences Department, Barcelona Supercomputing Center (BSC-CNS)

Food security under climate change

Climate change is a global threat on food security. The Mediterranean region is and will be one of the more affected areas by climate change worldwide. Observations from the last decades show a trend towards warmer conditions as well as changes in the seasonal distribution of precipitation in the Mediterranean, which compromise crop production objectives. Studies using climate projections point at a warmer situation by the end of the century. However, the effects of climate change will be already perceived in the near future, meaning that businesses such as agriculture will need to adapt promptly. Having climate information in advance on how the next season, year or decade will be, can help the agriculture sector to adapt to the effects of climate change in the near future.

Users as project partners

Users should be engaged from the early stages of projects to share their feedback for the co-development of climate services. Various participatory techniques, such as focus groups, workshops or interviews, can be used. From our experience, several user interactions are needed to ensure services' relevance and usability.

Seasonal and decadal predictions

Predicting the future variability of atmospheric variables during the crop growth cycle can provide useful information to farmers for the management of their crops. Climate predictions represent the future evolution of the climate system, covering the temporal range between the short-term weather forecasts (1-15 days) and the long-range climate projections (20-100 years).

Seasonal

- Crop management during the growing season (planting & harvesting dates, number of pest treatments, pruning…)
- Crop trade in the market
- Selection of crop types

Decadal

- Strategic planning and adaptation decisions (assessing average productivity in a particular regions in the next 20-30 years, new areas suitable for cultivation in the future, etc.)

Time scale

USER ENGAGEMENT

CLIMATE PREDICTIONS

FROM VARIABLES TO AGRO-CLIMATIC INDICES

UNDERSTANDING ADDED VALUE

TAILORED PREDICTION

TRANSFERENCE TO OTHER CROPS/SECTORS

Agro-climatic indices

Predictions of climatic, bioclimatic and climate extreme indices have an added value, since they are tailored to particular information requirements of users, and provide crop-specific information.

Examples

- Drought index (Standardized Precipitation Evapotranspiration Index, SPEI)
- Growing-season temperature (GST, Cº)
- Growing degree-days (GDD, Cº)
- Number of frost days
- Maximum length with dry spell (number of consecutive days with <1mm precipitation)

Testing of past events

To know what would have happened in the past if climate predictions would have been available for decision-making.
In a diagnostic analysis forecasts in the past are compared with observations (or reanalyses) to determine the added value of the predictions compared to the current approach used (climatology).

Bias-correction

Seasonal predictions are affected by biases and require correction to statistically resemble the observational reference and minimise forecast errors.

Quality assessment

A prediction has no meaning without an assessment of its quality. A skill score is calculated from the comparison of predictions with observations. Positive skill means that the model provides better information than assuming that past average conditions reflect future climate conditions.

Downscaling

Many times the spatial resolution of information provided by models is lower than the resolution that users need for decision-making (e.g. at the lot scale). Statistical downscaling is a technique used to provide climate predictions for a specific location.

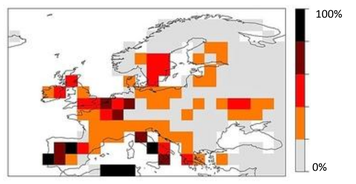
Added value of tailored predictions

The application of climate predictions can be extended to other crops cultivated worldwide, also those that are found outside the Mediterranean region (e.g. coffee). This demonstrates the global dimension of climate services, that can be used to build capacity in various climate-sensitive world regions.

Capacity building

Other sectors such as forestry and water management, can also benefit from climate predictions. These sectors, for example, can be severely affected by droughts, that can already be predicted 4-5 months in advance.

Prediction of moderate-to-extreme drought in August
(Turco et al. 2017)



The research leading to these results has received funding from the European Commission through the EU H2020 Framework Programme under grant agreement number 776467 (project MED-GOLD) and 730253 (project VISCA), the European Commission Service contract number 720829 (project JRC-decadal predictions) and the Ministerio of Economía y Competitividad under project 2015-70353-R (HIATUS).