Recent developments in seasonal climate predictions in Europe: benefits for agricultural sector

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Seasonal crop yield forecasting represents an important source of information to maintain market stability, minimise socio-economic impacts of crop losses and guarantee humanitarian food assistance, while it fosters the use of climate information favouring adaptation strategies. As climate variability and extremes have significant influence on agricultural production, the early prediction of severe weather events and unfavourable conditions can contribute to the mitigation of adverse effects. Seasonal climate forecasts provide additional value for agricultural applications in several regions of the world. However, they currently play a very limited role in supporting agricultural decisions in Europe, mainly due to the poor skill of relevant surface variables.

Here we present the results of assessing the grain maize yield sensitivity to heat and drought stress factors across different European regions. Empirical framework has been developed to predict the impact of heat stress and drought stress on maize yields. These models have been applied in seasonal forecasting framework to assess the predictability of maize yields already at the initial growth stages during the vegetative growth. Furthermore, the role of soil moisture content and surface air temperature for seasonal climate forecast initialization is analysed. We show that seasonal climate forecasts become useful in south-eastern Europe when realistic land surface initialization is applied, leading to skilful forecasts of extreme summer events related to heat waves and droughts, which are relevant also for maize growth.

Implications of skilful seasonal forecasts for agricultural applications are further discussed by exploring other types of predictor variables, such as large-scale atmospheric patterns influencing crop yields and new skilful drought prediction methods, generated by combining dynamical seasonal forecasts with monitored data.