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Adapting crops for a changing climate

Mikhail A Semenov and **Pierre Stratonovitch**
Rothamsted Research, UK

Increase in yield potential of major cereals is required to meet the predicted increase in demand for world food supply of about 70% by 2050. Sirius, a process-based wheat model, was used to estimate yield potential for wheat ideotypes optimized for future climatic conditions as predicted by global climate models for selected locations in Europe. The simulations showed that the detrimental effect of drought stress on yield could be decreased due to enhanced tailoring of phenology to future weather patterns, and due to genetic improvements in the response of photosynthesis and green leaf duration to water shortage. Increase in yield potential could be made through extending grain filling and thereby improve resource capture and partitioning. However the model predicted an increase in frequency of heat stress at around flowering. Controlled environment experiments showed the detrimental effects of heat and drought at booting and flowering on grain numbers and potential grain size. A current adaptation of wheat to areas of Europe with hotter and drier summers is a quicker maturation which helps to escape from excessive stress, but results in lower yields. To increase yield potential and to respond to climate change, increased tolerance to heat and drought stress should remain priorities for the genetic improvement of wheat.

mikhail.semenov@rothamsted.ac.uk