CRUK/University of Reading

A Platform for Climate Change Research on Cocoa

Improving our understanding of the effects of environmental variables on cocoa productivity

Climate change is likely to lead to challenging conditions in many cocoa growing areas, with predictions of less evenly distributed rainfall patterns and higher maximum temperatures, often compounded with the environmental effects of local deforestation. Strategies for sustainable cocoa production will be improved if they are based not only on accurate predictions of environmental change, but also on improved planting materials that are resilient to stresses such as drought, flooding and high temperatures. Previous research supported by CRUK at the University of Reading has shown that cocoa plants, in common with many crop species, respond positively to elevated CO_2 levels and that there is considerable genetic variation in photosynthetic and physiological traits. This phase of the research seeks to build on these findings by investigating the responses of juvenile plants and pod-bearing trees to various combinations of water-stress, high temperature and elevated CO_2 treatments.

A suite of six climate-controlled greenhouses is being used to simulate various predicted climate scenarios and measure cacao responses. Complementary experiments have been conducted in growth cabinets. The objectives are to:

- Provide a broader understanding of the impacts of climate change on yield and quality in cocoa.
- Synthesise knowledge gained on the impact of climate change on cocoa into a predictive physiological model that quantifies the impact of climate change variables on growth, development and yield in cocoa
- Develop tools for breeders to identify resilience to abiotic stresses.
- Examine ways in which the impacts of climate change can be ameliorated in the field through climate-ready strategies.
- Work in collaboration with research institutions in cocoa producing countries and other academic institutions interested in the effects of climate change on cocoa cropping.

This collaborative approach has already resulted in a process-based modelling study, which indicates that even under a high emissions scenario, cocoa net primary productivity (NPP) will be maintained in the regions of West Africa where cocoa is currently grown throughout the 21st Century. This finding is in contrast to previous models, but it is the first approach to take into account empirical data on cocoa responses to rising CO_2 concentrations. Although NPP is not equivalent to yield, it does represent the resource available to the plant for growth, including allocation into pod production. Further studies on the effects of environmental conditions on the allocation of resources to pod production and bean quality are underway.

Publications:
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