# Climate Change Impacts Agroexplorer

## About

The Climate Change Impacts Agroexplorer allows users to visualize and analyze a range of potential future agricultural production scenarios under climate change. Crop yield data were generated using the SIMPLE crop model (Zhao et al., 2019), which incorporates the effects of temperature, drought stress, management, soils, and atmospheric $CO_2$ concentration on crop yields. There are two versions of Agroexplorer, one with the full set of scenarios (https://dartgo.org/agroexplorer-full) and a simplified version with a limited set of scenarios (https://dartgo.org/agroexplorer-lite). The Climate Change IMpacts Agroexplorer was created through a collaboration between the Applied Hydroclimatology Group and Citrin Family GIS / Applied Spatial Analysis Laboratory at Dartmouth College.

## Variables

View - Visualize crop or climate variables
Time Period - Years averaged, mid-century (2035-2064) or end-of-century (2070-2099)
Climate Model - Global climate model used to create temperature and precipitation projections
Emissions Pathway - Anthropogenic greenhouse gas emissions scenario
Crop Variable - Measures of agricultural production and management
Planting Date - Day the crop is sown in spring
Time to Maturity - Amount of time needed for crop maturation
Heat Tolerance - Ability of crops to grow despite high maximum temperatures
Irrigation - Spatial extent of supplemental water applied to crop
Climate Variable - Measures of climate

## Data Sources

Historical climate data are from Daymet Version 4, and future climate data were calculated using projections from five Coupled Model Intercomparison Project Phase 6 (CMIP6) global climate models meant to sample a range of future climates (warm and wet, warm and dry, hot and wet, hot and dry, median), under moderate and high greenhouse gas emissions scenarios (Shared Socioeconomic Pathways 2-4.5 and 5-8.5). Soils data are from the Global Soil Dataset for Earth System Modeling.

## Worksheet

The Climate Change and Agriculture Data Investigation was co-created with an Advanced Placement (AP) Environmental Science teacher and class in Lebanon, New Hampshire. The investigation was designed for a 50-minute instructional period, with post-investigation questions intended to be completed after class. The worksheet guides students through collecting and analyzing data from the Climate Change Impacts Agroexplorer to assess the relationship between historical temperature, future temperature, and crop yields. We also developed an introductory slide to briefly introduce the model. We used climate data for Iowa and Illinois from NOAA online weather data (https://nowdata.rcc-acis.org/ilx/ and https://nowdata.rcc-acis.org/dmx/). The investigation, introductory slide, and weather data are contained in a .zip folder under the Agroexplorer Investigation link on this page. Both versions of Agroexplorer could be used to complete this investigation, but it was designed to be used with the simplified version (https://dartgo.org/agroexplorer-lite). If you have any feedback on the Climate Change Impacts Agroexplorer, or would like an answer key to the investigation, please email Applied.Hydroclimatology@dartmouth.edu.

## References

Zhao, C., Liu, B., Xiao, L., Hoogenboom, G., Boote, K.J., Kassie, B.T., Pavan, W., Shelia, V., Kim, K.S., Hernandez-Ochoa, I.M. and Wallach, D., 2019. A SIMPLE crop model. *European Journal of Agronomy*, 104: 97-106.