

## Growing Degree-Day Calculator for the Southeast USA

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### Key Messages:

- Growing degree-days (GDD), which is an index calculated using temperature data, is often used to estimate the time needed for a crop or other organisms to reach maturity or to reach a certain stage of development.
- An online GDD calculator has been developed to facilitate calculation of GDD for the southeast USA.
- The GDD calculator is freely available from the AgroClimate website at: <http://agroclimate.org/tools/Growing-Degree-Days/>.
- The GDD calculator can be used to generate GDD information for different scenarios, such as different locations, crops, time periods and planting dates.

### The Growing Degree-Day Calculator

GDD accumulated during a period of time can be calculated as:

$$GDD = \sum_{i=1}^n \left( \frac{T_{max} + T_{min}}{2} \right) - T_b \quad (1)$$

Where  $T_{max}$  and  $T_{min}$  are the daily maximum and minimum air temperatures,  $n$  is the number of days, and  $T_b$  is the base temperature.  $T_b$  is the temperature at which the rate of growth for the particular crop or other organism is zero.

Since obtaining temperature data and calculating GDD for the location and crop of interest can be time consuming, AgroClimate has developed an online tool to facilitate calculation of GDD for the southeast USA region. The tool is called **Growing Degree Days Calculator**, and is freely available at: <http://agroclimate.org/tools/Growing-Degree-Days/>. A screen shoot of the GDD calculator is shown in Fig. 1.

The GDD calculator uses historical and current temperature data from an extensive network of weather stations covering several states in the Southeast USA region, including the states of North Carolina, South Carolina, Alabama, Georgia, and Florida. The GDD

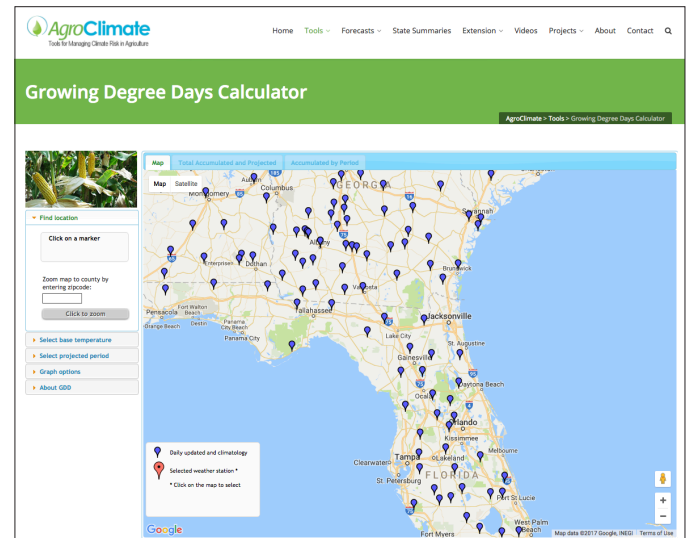


Figure 1. Screen shot of the Growing Degree Days Calculator.

calculator allows users to choose the options they would like to include in their GDD calculations, including:

1. The location of the temperature measurements, which can be selected from a map. Users can also input their zip code to get the map to zoom in to their location.
2. The base temperature ( $T_b$ ). Users can select 40, 50, or 60 °F.
3. The projected period. Users can select the start and end dates of the period of time of interest from a calendar.
4. Graph options. Users can select to display de average, and/or display data from last season.

The GDD calculator uses Eq.1 to calculate the GDD accumulated during a given period of time. Once the options are selected, the GDD Calculator calculates daily GDD's and produces several graphical and tabular outputs. These outputs are organized into two tabs (shown at the top of the page), the **“Total Accumulated and Projected”** tab, and the **“Accumulated by Period”** tab.

Both tabs show basically the same data, but the **“Total Accumulated and Projected”** tab shows the data accumulated daily, while the **“Accumulated by Period”**

tab shows the data broken down into periods covering several days. The outputs include a table with the total GDD accumulated during the selected period for “This season,” “Last season,” and the “Historical average.” Similarly, the graphical output includes the “Current accumulation,” “Historic average,” and “last season.” If the selected period expands into a future date, the “Total Accumulated and Projected” tab also includes the projected GDD accumulated during “El Niño years, long-term climatology.”

## Using the GDD calculator

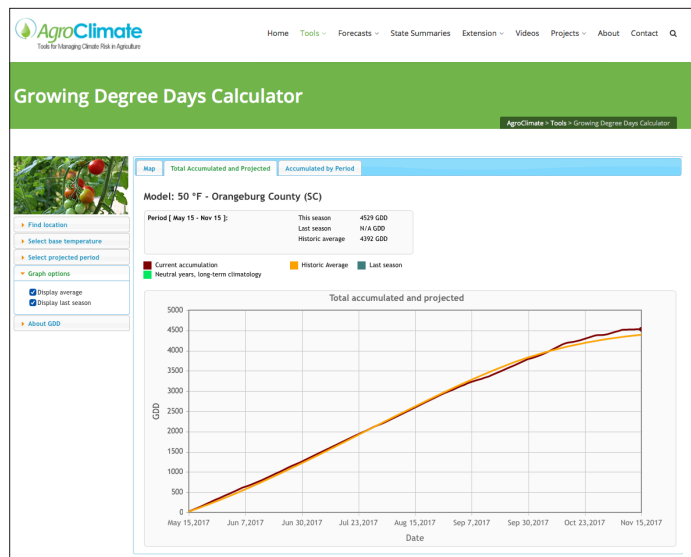
**Example:** A cotton grower near Orangeburg, SC, would like to know the Growing Degree Days accumulated near his property during the 2017 cotton growing season. He has the following information:

- Zip Code for Orangeburg, SC = 29039
- Cotton planting date = 15 May, 2017
- Cotton Harvest date = 15 Nov, 2017
- Base Temperature = 54 °F

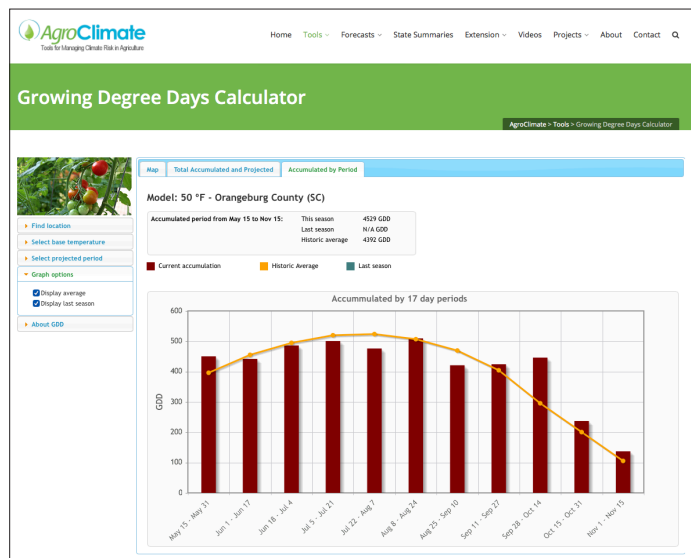
### Using the Growing Degree Days Calculator to get the answer:

1. Go to: <http://agroclimate.org/tools/Growing-Degree-Days/>
2. Go to the left hand side of the page and click on the “Find location” menu item. Enter the Zip Code “29039” in the box provided and click on the “Click to zoom” button.
3. The map will zoom in and highlight the area near Orangeburg.
4. Click on the pin nearest Orangeburg. A message box will open with some information about the weather station. Click on the “Click for Graphs/Data” button. This will start calculations and produce outputs with the default values. You need to change these default values and enter your own values.
5. Click on the “Select base temperature” menu item (left hand side of the page). From the drop down menu, select 50 °F, which is the closest to 54 °F.
6. Click on the “Select projected period” menu item and select the Start (May 15, 2017) and End (November 15, 2017) dates. Make sure to select the 2017 year.
7. Click on the “Graph option” menu item and select both the “Display average” and the “Display last season” options.
8. After selecting these options, GDD will be recalculated automatically. The outputs are shown in Fig. 2 and 3.

By changing options in the GDD calculator, the user can generate GDD information for different scenarios such as different locations, different time periods and planting dates, and different crops. The generated GDD information could allow users to explain differences in crop development among locations, planting dates, crop hybrids, and growing seasons. This information could potentially also be used to determine if a particular crop would be suitable for a particular environment. If the farmer knows the GDD needed for a particular crop hybrid to reach a particular growth stage (this



**Figure 2. Screen shot of the Growing Degree Days Calculator showing the GDD accumulated daily during the 2017 cotton growing season near Orangeburg, SC.**



**Figure 3. Screen shot of the Growing Degree Days Calculator showing the GDD accumulated in 17-days periods during the 2017 cotton growing season near Orangeburg, SC.**

could be obtained from the seed companies), the GDD information generated using this tool could help the farmer better plan application of agricultural inputs (fertilizers, pesticides, irrigation, etc).

## References:

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