

Corn GDD_{DST}

Track real-time GDD accumulations and learn about climate risks for corn development.



GDD.AgClimate4U.org

The Corn GDD_{DST} puts current conditions into a 30-year historical perspective and offers trend projections through the end of the calendar year for any location in the U.S. Corn Belt. Corn GDD projections, combined with analysis of historical data, can help you make decisions about:

- **Climate Risks** - Identify the likelihood of early and late frosts/freezes.
- **Activity Planning** - Compare corn GDD projections and estimated corn hybrid maturity requirements to aid seed purchasing and other growing season decisions.
- **Marketing** - Look at historical and projected corn GDD when considering forward pricing and crop insurance purchases.

Data and information derived from the tool can be used to make helpful inferences about current conditions, especially when combined with personal experience and localized knowledge.

Using Corn GDD in Farming Decisions

The Corn GDD tool can provide decision support on a variety of issues throughout the entire growing season by integrating current weather data, historical climate data and farm-specific crop information into an easy-to-use tool.

Before your crop is even planted you can start using Corn GDD information. Test the effects of different seed maturity ratings and planting dates on crop growth milestones, informing your early seed purchases. Use historical freeze data to assess the risk of frost damage at planting and harvest time, helping you determine when you might want to plant. Real-time Corn GDD data can provide valuable insights in forward pricing crops by projecting when plants may reach maturity.

The Corn GDD tool can also help you assess risk and adjust to a shorter growing season in case of wet or delayed spring planting. Using Corn GDD data, you may choose a shorter season variety or, in the case of seed shortages, switch to another crop entirely.

When presented with your farming decisions, climate is just one of many important factors that you need to consider. The Corn GDD tool takes the guesswork out of assessing your climate-related risks. Come explore the countless ways Corn GDD can be integrated into farming operations.

Corn GDD Scenarios

Planting delays

At the beginning of the growing season, a farmer may be faced with planting delays due to wet fields. The Corn GDD tool can be used to decide if a shorter-season corn variety is needed to increase the chance of reaching crop maturity before the first fall frost.

Mid-season adjustments

During the growing season, the Corn GDD tool can be used to track current corn development and anticipate upcoming corn growth milestones for spraying or side-dressing nitrogen. Using the historical data to finish the growing season gives farmers an idea of when the crop might reach maturity in the fall.

Monitoring crop progress and marketing trends

Because the Corn GDD tool spans the entire Corn Belt, farmers and ag advisors can track growing conditions across multiple counties. Tracking crop progress and frost risk across the region could provide insights on marketing trends. For example, in 2014 the northern Corn Belt experienced a cold, wet spring and a cooler-than-average summer, which raised concerns about crop progress and vulnerability to fall frost. This could provide marketing opportunities to farmers outside of that region.

Data Sources

Corn GDD Data

The Corn GDD tool uses daily gridded minimum and maximum temperature data from the [Applied Climate Information System \(ACIS\)](#), a quality controlled database maintained by the National Oceanic and Atmospheric Administration's (NOAA) Regional Climate Centers. Gridded data are derived from nearby weather observation stations, which allows data to be available for the entire region at about a 4-km resolution. GDD data are calculated from the gridded temperature data using the 86/50 method, making it specific to corn development. Corn GDD data are updated nightly, and historical data from 1981 to 2010 are available.

Corn GDD Projection

The GDD Projection starts from the current day and goes through the end of the current year. The first 30-days of the GDD Projection are based on a weather model (CFSv2) forecast. The CFSv2 forecast provides daily high and low temperatures which are then used to calculate the daily GDD accumulation using the 86/50 method (updated daily). The remaining projection through the end of the year is based on average historical GDD accumulations from the last 30 years (1981-2010).

Corn Growth Stages

An algorithm for estimating Silking and Black Layer dates was developed from an analysis of about 550 Pioneer hybrids. Estimates of corn growth stage (V2-V10) are based on ISU publication PMR 1009, Corn Growth and Development. The Corn GDD tool assumes crop emergence after 105 GDD, and new collared leaf appearance every 84 GDD.

Freeze Probability

The probability of last spring freeze shows the number of times the last freeze occurred after the selected planting date (GDD start date) from 1981 to last year. For example, if the last spring freeze occurred after the start date 16 times in the last 33 years, the probability would be 16/33 or 48 percent. The probability of first fall freeze shows the likelihood of the first freeze occurring before Black Layer is achieved. Based on recommendations from Purdue University statisticians the following formula is used:

$$P(\text{first freeze before Black Layer}) = \frac{\text{summation}_t P(\text{freeze at } t) P(\text{Black Layer} > t)}$$

For more information, click on the [About GDD](#) tab on the upper right side of the Corn GDD tool.



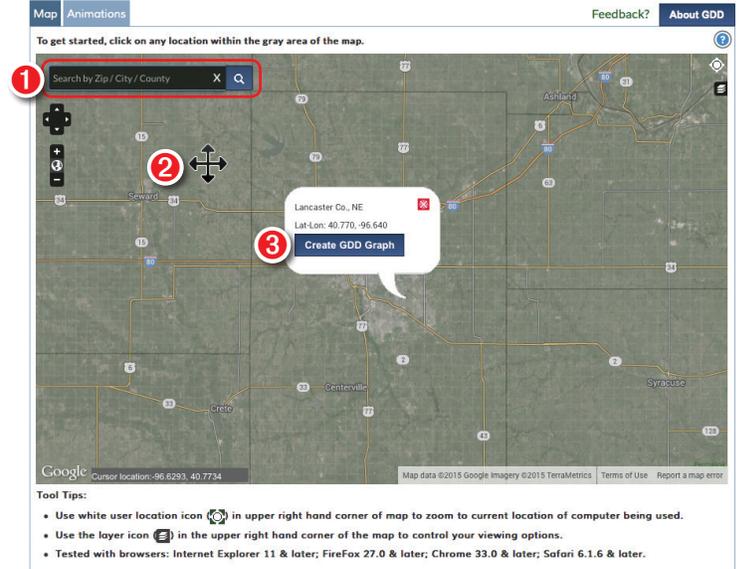
User Guide

Follow these simple instructions to use the Corn GDD tool to create a graph and customize your data for projecting GDD. Click on the blue icons on any page for step-by-step instructions on using the tool and customizing the graph. For more background information on the Corn GDD tool, click on the blue About GDD tab in the upper right corner of the tool.

Select Location & Create GDD Graph

To start, locate your area of interest. This can be done in various ways:

- 1 Type in a ZIP code, city name, or county name into the search bar. Then select your location from the auto-populated list beneath the search bar, and the map will zoom to that location.
- 2 Manually drag the map or zoom to your area of interest.
- 3 Once your location has been identified, click on the map. Then click on the Create GDD Graph button to view data for your location.



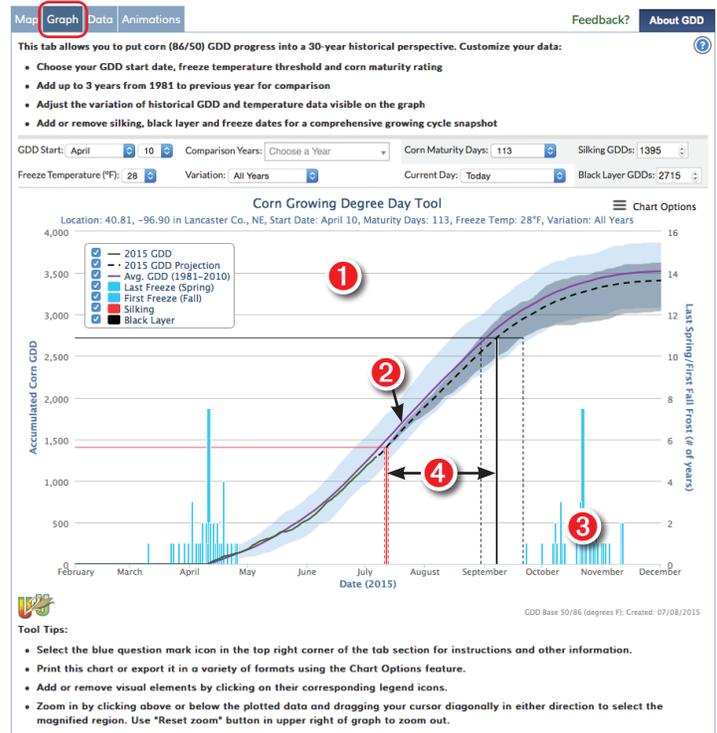
GDD Graph* Overview

The Graph tab will display (by default):

- 1 The growing degree days graph
- 2 Real-time, historical and projected GDD data
- 3 Historical freeze dates**
- 4 Estimates of silking and black layer dates for corn

* Any changes made to the customized user inputs will be applied to both the Graph and Data tabs.

** Spring freeze data will not be displayed by default if the current day is more than two weeks past the last freeze in the historical record. Fall freeze data are always shown by default.



Tool Tips:

- Select the blue question mark icon in the top right corner of the tab section for instructions and other information.
- Print this chart or export it in a variety of formats using the Chart Options feature.
- Add or remove visual elements by clicking on their corresponding legend icons.
- Zoom in by clicking above or below the plotted data and dragging your cursor diagonally in either direction to select the magnified region. Use "Reset zoom" button in upper right of graph to zoom out.

Download Data >

Corn GDD Features

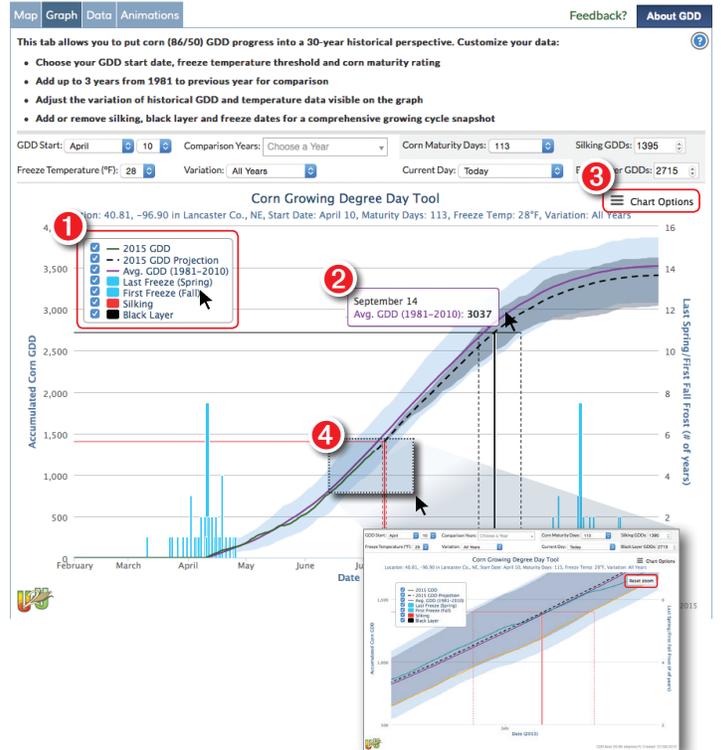
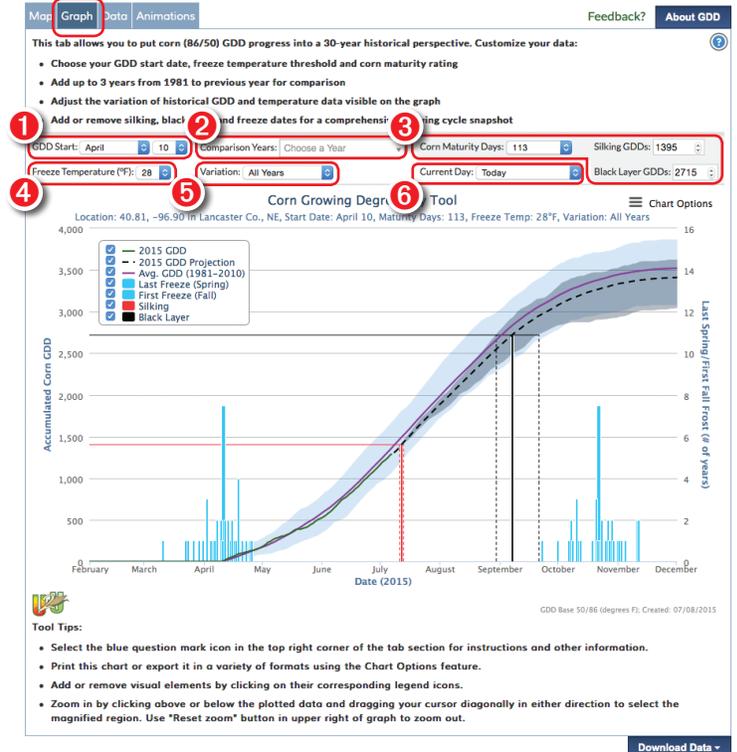
Adjust these features for a customized view of the Corn GDD graph*:

- 1 GDD Start** represents your planting date. Growing degree days will begin accumulating after this date.
- 2 Corn GDD Comparison Year**
Compare accumulated Corn GDD data for up to three past years back to 1981.
- 3 Corn Maturity Days / Silking GDDs / Black Layer GDDs**
Input the corn maturity rating for your specific seed, or customize your crop maturity requirements by adjusting the Silking GDDs and Black Layer GDDs. (Values typically provided by your seed company).
- 4 Freeze Temperature**
Adjust the freeze temperature. The default is set to 28°F, which is the temperature threshold for when corn damage may start occurring.
- 5 Variation**
Control the spread of historical Corn GDD (gray shading on the graph) and freeze date (blue vertical lines) data that appears on the graph. Options include viewing all years of data (1981-2010), the middle 20 years of data, or the middle 10 years of data.
- 6 Current Day**
See how Corn GDD projections would have looked throughout the current and previous year.

Customize Graph

- 1** Add/remove variables from the graph by clicking on the corresponding item in the legend.
- 2** Hover the mouse pointer over the graph and a pop-up box will appear, displaying a table of the data for that point in the graph.
- 3** Click on Chart Options in the upper right corner of the graph to print or download the graphic.
- 4** Zoom in by clicking above or below the plotted data and dragging your cursor diagonally in either direction to select the magnified region.

* Any changes made to the customized user inputs will be applied to both the Graph and Data Tab.



magnified region

Data Tab*

- 1 Click on the Data tab to get a text description of the graphical data, estimated dates for growth stages (V2-V10), freeze probabilities, and a table showing daily Corn GDD accumulations. You can view data for the current year as well as historical data (both average and high/low range).
- 2 Accumulated GDD Details shows a table of daily data.
- 3 Click on the Download Data button to download the historical average and daily Corn GDD data for the selected location. Historical first and last freeze data can also be downloaded.

1 Corn Growing Degree Day (GDD) Results

	This Year (2015)	Average	Occurs within this range for all years
GDD Accumulation (April 10 - July 7)	1291	1364	1069 - 1676
V2 Date	May 8	May 11	May 1 - May 26
V4 Date	May 26	May 23	May 12 - June 7
V6 Date	June 6	June 3	May 20 - June 17
V8 Date	June 14	June 12	May 31 - June 23
V10 Date	June 22	June 19	June 8 - July 1
Silking Date (Estimated (Earliest-Latest))	July 12 (July 11 - July 13)	July 8	June 26 - July 19
Blacklayer Date (Estimated (Earliest-Latest))	September 7 (August 30 - September 20)	September 2	August 15 - September 26

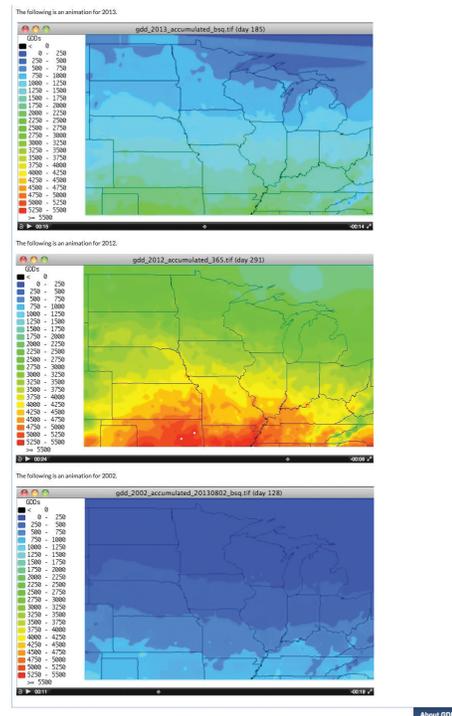
2 Accumulated GDD Details

Date	Accumulated GDDs	GDDs per Day	Vegetation Stage	Forecast Range	1981-2010 Range	1981-2010 Average
Apr 10	0	0				0
Apr 11	8	8				6
Apr 12	20	12				12
Apr 13	34	14				18
Apr 14	42	8				25
Apr 15	52	10				34
Apr 16	59	7				43
Apr 17	70	11				50
Apr 18	84	14				58
Apr 19	93	9				67

3 Download Data

Animations Tab

Click on the Animations tab to view time-lapse visual representations of annual growing degree day accumulation for several selected years.



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Interpreting Graph Data

The following details will help you understand the various curves and lines on the Corn GDD graph.

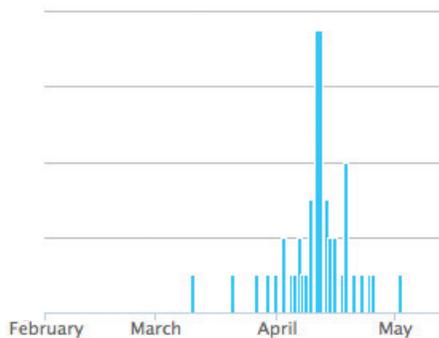
Graph Key

- GDD:** Shows current year GDD accumulation up to yesterday.
- GDD Projection:** Shows projected GDD accumulations for the rest of the year. The first 30-days are based on a weather model forecast. The remaining projection is based on average historical conditions.
- GDD Comparison:** Shows the GDD accumulation for a comparison year.
- Average GDD:** Shows the 30-year average GDD accumulation.
- Historical GDD Variation:** Displays the range of highest and lowest GDD accumulations in the historical record (associated with the purple line).
- Projected GDD Variation:** Displays the potential range of projected GDD accumulations. The first 30-days shows the highest and lowest scenarios of 20 model forecasts. The remaining projected variation displays the highest and lowest accumulations in the historical record.

Freeze Potential

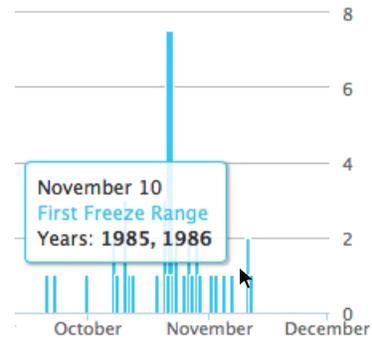
Spring

The first set of **light blue vertical bars** shows the historical last spring freeze dates since 1981. The tallest bar indicates the average last freeze date. The height of each bar, with the exception of the average bar, indicates the number of years that had a last freeze on that date. These data allow you to visualize the likelihood of a freeze impacting the crop early in the growing season, which could influence planting date and crop variety decisions.



Fall

Another set of **light blue bars** shows the historical first fall freeze dates since 1981. The tallest bar indicates the average first freeze date. The height of each bar, with the exception of the average bar, indicates the number of years that had a freeze on that date. These data allow the user to assess the likelihood of a freeze impacting the crop late in the growing season, which could influence planting and crop variety decisions as well as harvest decisions. For example, a user might find that the potential for a fall freeze to hit before the crop reaches black layer is too high for their comfort. Shifting to a shorter season corn variety reduces that potential.

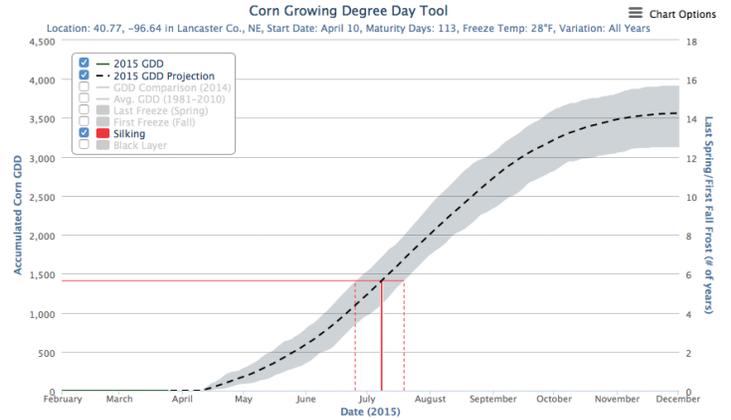


Silking Range

The **red bars** indicate the projected window for corn to enter its silking stage. The **solid red bar** in the middle represents the estimated silking date given the current and projected GDD accumulation.

The **dashed red bars** on either side of the solid one indicate the potential range in the silking date based on the projected Corn GDD accumulation for the rest of the year. The projected silking date is computed as a function of the GDD start date (assumed planting date) and the Corn Maturity Days. You can customize both of these variables.

The silking date estimates will help you determine whether the corn will enter silking during the hottest part of the year. This information could influence planting and crop variety decisions by enabling producers to avoid heat stress during silking, which can reduce corn yields.

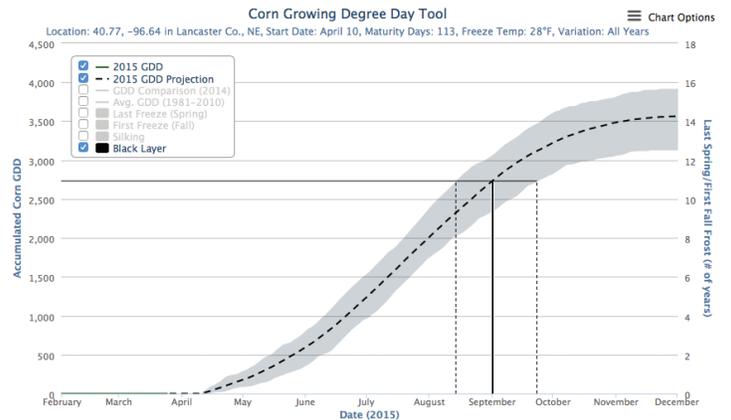


Black Layer

The **black bars** indicate the projected window for corn to enter its black layer stage. The **solid black bar** in the middle represents the black layer date projection given the current and projected GDD accumulation.

The **dashed black bars** around the solid one indicate the potential range in the black layer date, based on the projected Corn GDD accumulation for the rest of the year.

The projected black layer date is computed as a function of the GDD start date (assumed planting date) and the Corn Maturity Days. You can choose both of these variables. Compare the black layer projections to the fall freeze information to evaluate the potential for a freeze to affect the corn crop before maturity.

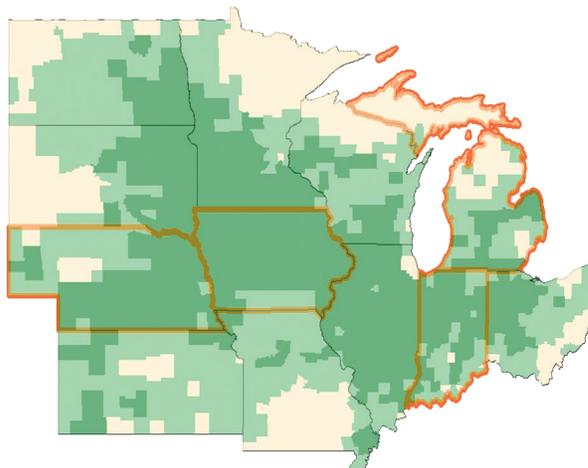


About Useful to Usable (U2U)

U2U is an integrated research and extension project, funded by the USDA, to improve farm resilience and profitability in the North Central U.S. by transforming existing climate data into usable products for the agricultural community. Our goal is to help producers make better long-term plans for what, when and where to plant, and how to manage crops for maximum yields and minimum environmental impact.

The U2U team includes climatologists, agronomists, social scientists and computer specialists who have come together to create tools to aid in farming decisions. Partners include Purdue University, Iowa State University, Michigan State University, South Dakota State University, University of Illinois, University of Michigan, University of Missouri, University of Nebraska, University of Wisconsin, the High Plains Regional Climate Center, the Midwestern Regional Climate Center, and the National Drought Mitigation Center.

U2U Study Region



-  **Pilot States**
-  **Major Corn Growing Area**
-  **Minor Corn Growing Area**

Crop data from National Agricultural Statistics Service (NASS) U.S. 2007 Census of Agriculture
 Major corn areas harvested over 60,000 acres of corn
 Minor corn areas more than 5,000 acres of corn

Map created by Adam Reimer

PROJECT CONTACTS:

Linda Prokopy
 Associate Professor and Project Lead, U2U
 Purdue University
 765-496-2221
lprokopy@purdue.edu

Melissa Widhalm
 Project Manager, U2U
 Purdue University
 765-494-8191
mwidhalm@purdue.edu



For more information, please visit
AgClimate4U.org
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