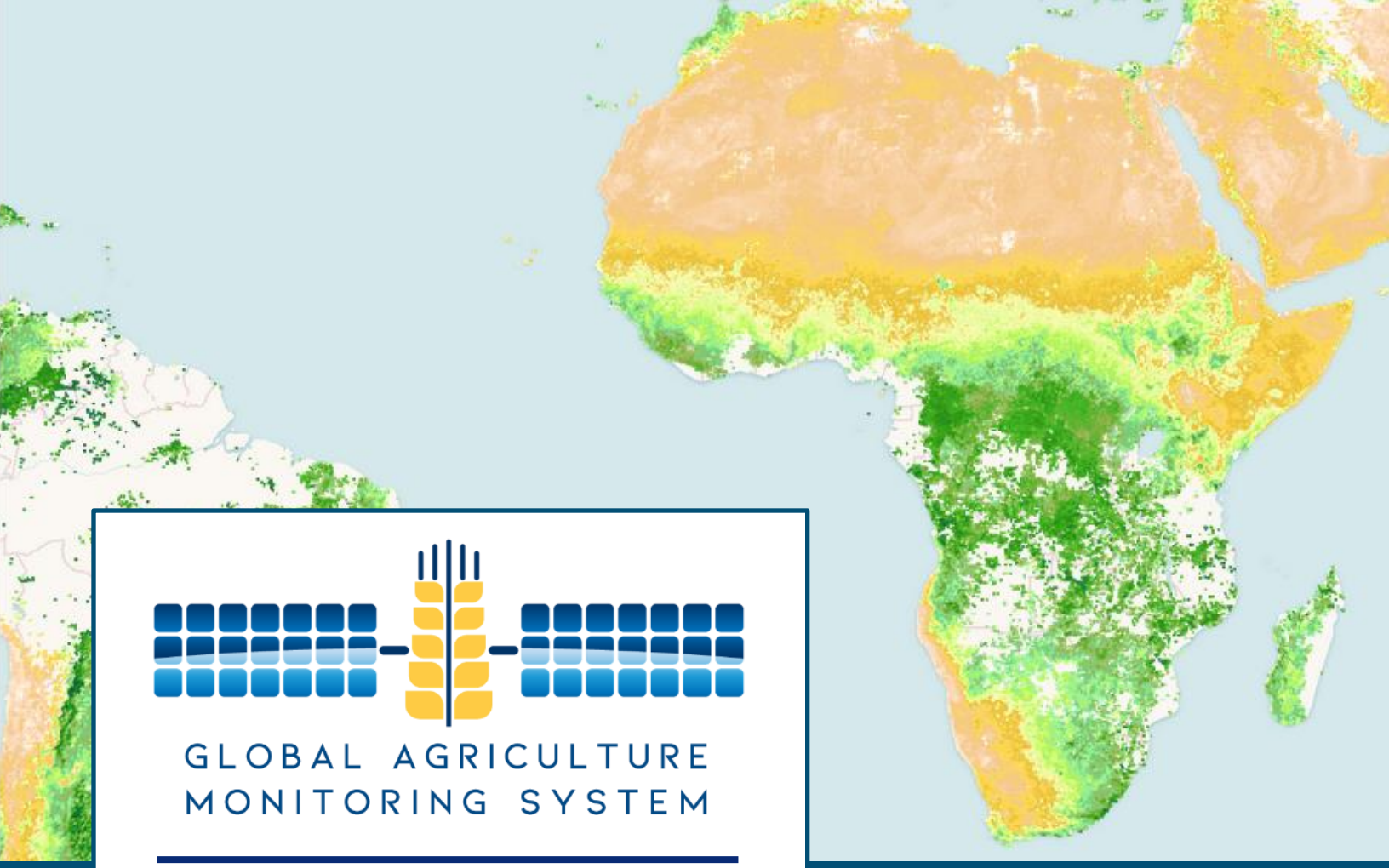


GLOBAL AGRICULTURE MONITORING SYSTEM

USER GUIDE

HARVEST

UPDATED: 2023-04-13

TABLE OF CONTENTS

Background 4

About NASA Harvest 4

About Harvest GLAM 4

Application Overview 5

Part 1: Visualize 7

Selecting a Dataset 7

Applying a Crop Mask 8

Visualizing Anomaly 9

Adding Boundary Layers 10

Feature Snapshot 12

Map Customization 12

Capturing an image of the map 14

Querying the map 14

Part 2: Analyze 17

Dashboard Overview 17

Adding a Tool 17

Removing a Tool 19

Selecting an Area for Analysis 20

Administrative Boundaries 20

User Created Geometry (Draw Your Own) 21

User Uploaded Geometry 22

Query Tool 24

Time Series Tool 25

Simple Time series 26

Multiple Years 28

Continuous Series 30
Charting Multiple Products 31
Summary Statistics.....32
Histogram Tool 37
Graphic Tool 39
Part 3: Export.....42
Export Overview 42
Selecting a Dataset.....43
Selecting an Area for Analysis 44
Adding an Export to the Queue.....44
Export Status 45
Downloading 46

Background

About NASA Harvest

Established in 2017, Harvest is NASA's global food security & agriculture consortium.

The mission of NASA Harvest is to enable and advance adoption of satellite Earth observations by public and private organizations to benefit food security, agriculture, and human and environmental resiliency in the US and worldwide. Harvest accomplishes this through a multidisciplinary and multisectoral Consortium of leading scientists and agricultural stakeholders, led by researchers at the University of Maryland and implemented together with partners across the globe.

Learn more about NASA Harvest at nasaharvest.org

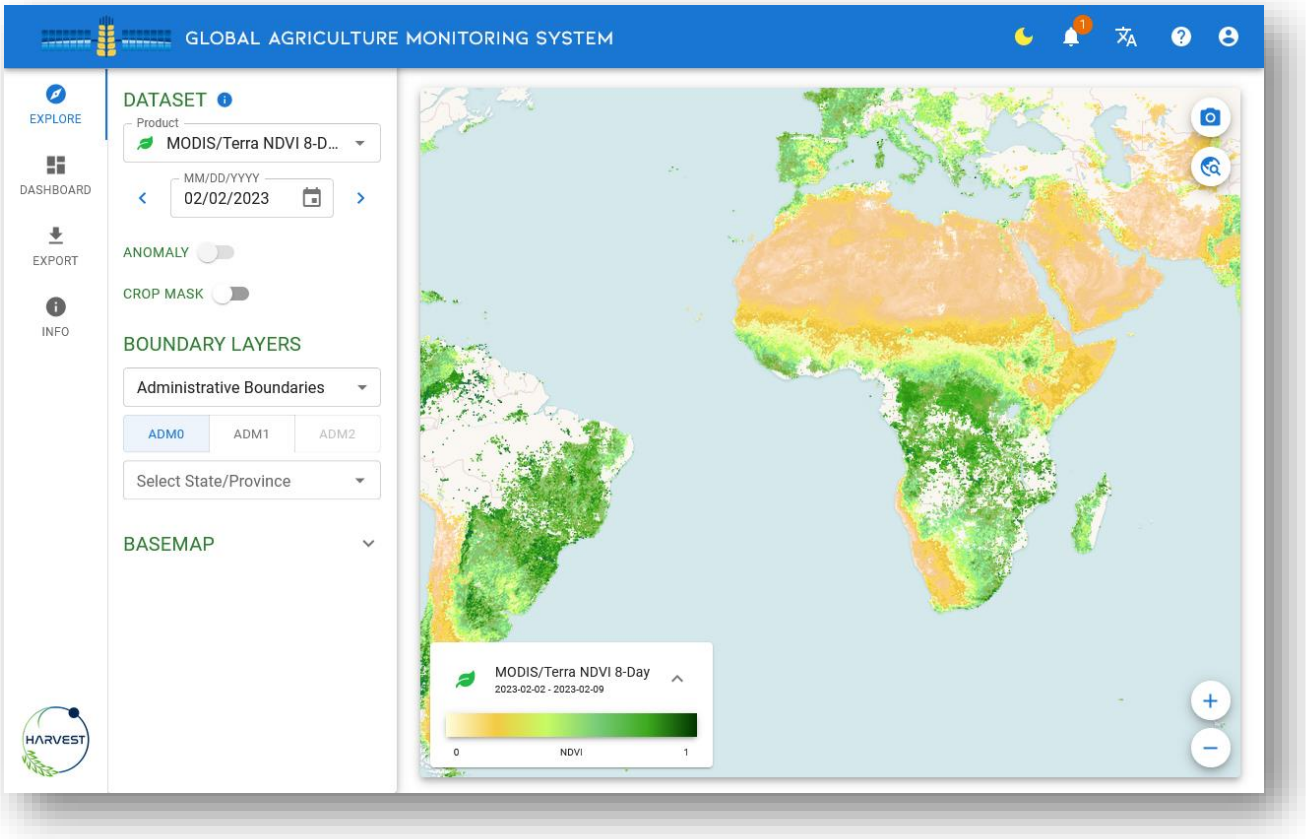
About Harvest GLAM

The Global Agriculture Monitoring System (GLAM) is a web-based platform, designed to enable near-real-time visualization and analysis of global croplands using MODIS and VIIRS land surface reflectance products in tandem with a variety of other datasets to empower continuous crop condition monitoring.

Harvest GLAM began over a decade ago as the Global Agriculture Monitoring Project - a joint initiative between NASA, USDA, the University of Maryland, and South Dakota State University. While the project has evolved over time, the aim and purpose has remained the same – to empower continuous crop condition monitoring through the use of NASA's moderate resolution satellite data and to develop a system which can be used by both specialists and non-specialists for crop analysis.

After years of operational use and valuable feedback from users and partners, the Harvest GLAM application was redesigned as a modern web mapping application leveraging new cloud computing architecture and open source geospatial software.

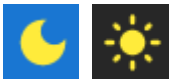
Application Overview



When the application has loaded, the user will be presented with the **Explore** page by default. You can change which page is shown by clicking one of the icons on the left side panel.

The current page options are **Explore**, **Dashboard**, **Export**, and **Info**.

At the top of the page you will find the application header which allows for quick access to a series of buttons/tools:

- **Theme** (Moon/Sun Icon) – Click this button to switch the application to a dark or light theme. 

- **Notifications** (Bell Icon) – Click this button to view the latest news or announcements about GLAM. 

- **Translations** (Character/Letter Icon) – Click this button to translate text in the application to your preferred language. Current available languages include English, Spanish, Portuguese, and French. 
    - Please contact us is you would like the application to be translated into another language

- **Help** (Question Mark Icon) – Click this button for contact information if you need assistance using the application. 

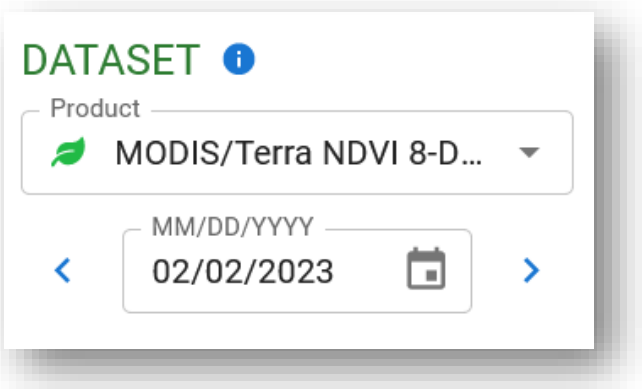
- **User Account** (Person/User Icon) – Coming Soon. Click on this button to log into GLAM or view account details. User accounts will be integrated in a forthcoming application update. 

Part 1: Visualize

The Explore Page allows users to visualize imagery of available products on a web map.

(If not already selected, click **Explore** left site panel to navigate to the Explore Page.)

Selecting a Dataset

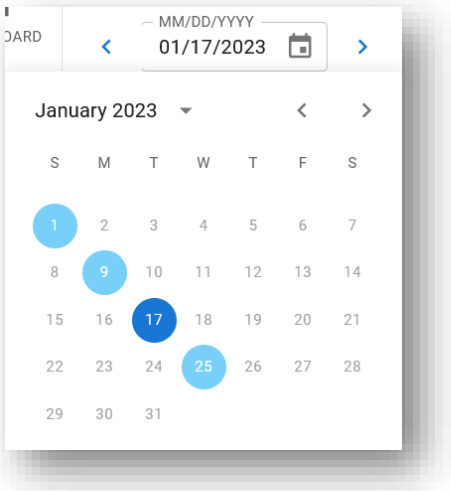


1. To select an imagery dataset for visualization, first select your desired product. The latest MODIS/Terra 8-Day NDVI dataset will be selected by default.

   To change the product, click the arrow next to the product listed to see a drop-down list of available products. Icons next to each product name will indicate the type of product. For example, the leaf icon will indicate an NDVI product while a rain cloud icon will indicate precipitation.

   Click on your desired product from the drop-down list to select it.

   After changing the product, the calendar below will automatically be populated with dates for which imagery is available.



2. Next, select the desired date for the imagery product that you would like to visualize. When a product is changed, the date will automatically change to the closest date available to the previously selected date.

   To change the date of the imagery that you would like to visualize, select a date from the calendar, or use the arrows on either side to automatically select the previous or next available imagery date.

   Expand the calendar by clicking on the calendar icon. Dates for which imagery is available will be shaded in light blue while the selected date will be a darker shade.

Note: For composite images (imagery data collected over many days) dates in the calendar represent the start of the composite period. The full composite period for the date selected will be displayed in the map legend.

With the calendar open, you may simply click an available date to select it, navigate to another month using the arrow buttons, or use the dropdown to select a different year

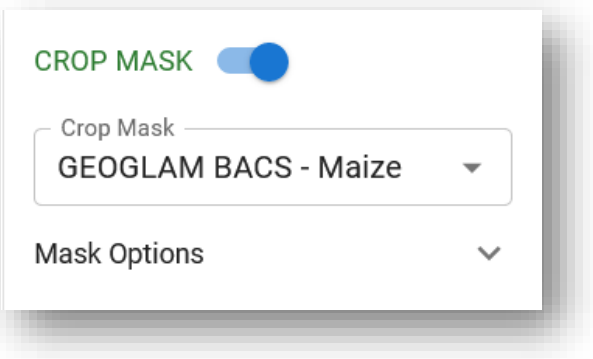
After a date is selected, the image on the map with automatically change to the new imagery.

Applying a Crop Mask

One of the benefits of the new Harvest GLAM computing architecture is the ability to mask imagery datasets “on-the-fly”. In contrast to the previous system, which required onerous pre-processing of image & mask combinations, map tiles of masked imagery are simply generated upon request and displayed on the map almost instantly.

This capability allows the user to filter image data to only view imagery for relevant crop areas.

1. To visualize imagery using a crop mask, first switch on the **CROP MASK** toggle button.
   Once switched on a drop-down selector will appear. By default, “No Mask” will be selected.



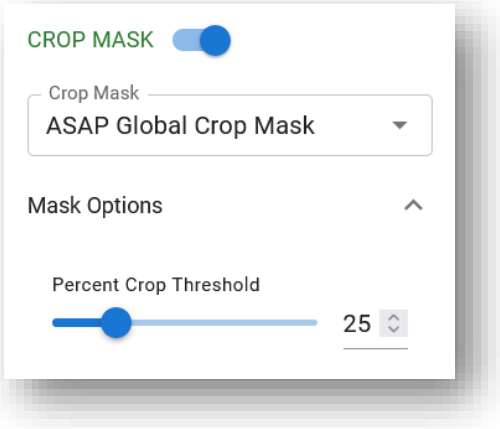
2. To choose a crop mask click the arrow next to “No Mask” or whichever mask is selected and a drop-down list will appear. The list of available masks will be sorted by geographic area, with the primary masks categorized as “Global”. More information on available masks can be found on the **Info** page.

   Click on one of the available mask options to select it. Once Selected, the imagery on the map will automatically update to filter out data, only showing data in areas covered by the crop specified by the selected mask.

3. Some crop masks, like in the case of the GEOGLAM Best Available Crop Specific Masks (BACS), are percent based, meaning that each pixel contains a certain percentage of the crop in question. In this case, a default threshold is applied. This means that areas equal to or above the threshold (percent crop) are displayed.

Using the GEOGLAM BACS as an example, we use a default threshold of 4%. So, by default when a GEOGLAM BACS mask is selected, image data will be displayed for areas where there is 4% or more coverage of the selected crop.

4. The “on-the-fly” masking capability of the Harvest GLAM system allows users to modify this threshold for percent-based crop masks. If the selected mask is percent based, a collapsible menu will appear labeled “Mask Options”. Click on “Mask Options” to open the menu. Once opened you will see a slider which you can drag to change the percent crop threshold value. The threshold can also be changed using the number input box rather than the slider tool.



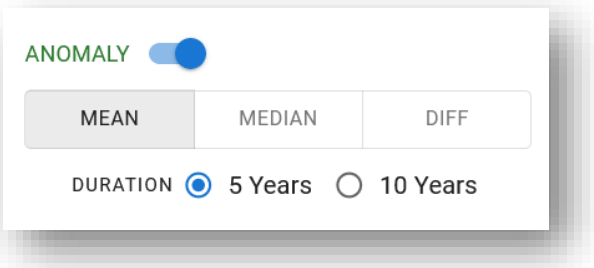
Other crop masks available in the Harvest GLAM system will simply be binary masks, meaning that the crop in question is either present (1) or not (0). When one of these masks is selected the map imagery will update to simply show areas where the crop in question is present according to the selected mask.

5. Either select “No Mask” or switch off the **CROP MASK** toggle to un-mask the selected imagery.

Visualizing Anomaly

The aforementioned capability to generate “on-the-fly” map tiles also allows much simpler anomaly visualization.

1. To visualize anomaly from the mean, median, or from a previous year, switch on the **ANOMALY** toggle button.

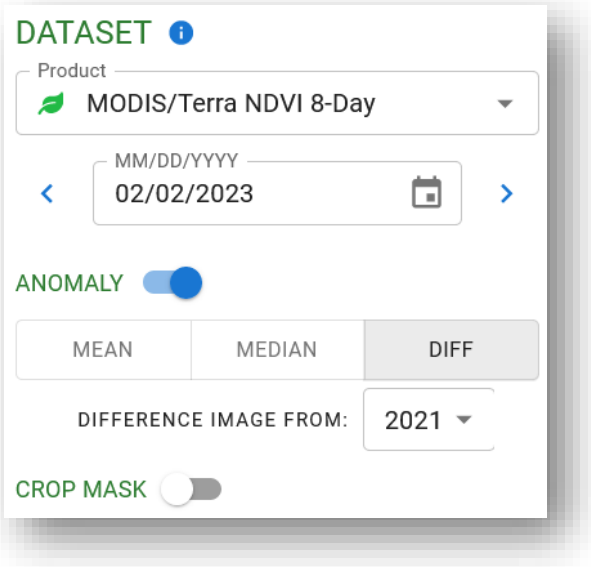


   Once switched on, a menu of options will appear. The first is a series of buttons labeled **MEAN, MEDIAN,** and **DIFF.**

   When the **MEAN** button is selected, the imagery displayed on the map will automatically update to show the difference between the imagery values of the selected date, and the mean for this day of year over a period of time. The same is true for the **MEDIAN** option.

2. The current options for the duration of **MEAN/MEDIAN** are 5 or 10 years. These options may expand in future updates. Click either the **5 Years** or **10 Years** option to visualize difference between the date selected and the 5 year mean or median for this day of year.

3. To visualize the difference between the currently selected imagery date and the same day in a previous year, click on the **DIFF** button. Rather than the Duration options that appeared for the **MEAN/MEDIAN** options, a drop-down menu will appear labeled **DIFFERENCE IMAGE FROM**. Select a year from the dropdown list to see the difference between the current imagery and the imagery for the same day in the year selected.

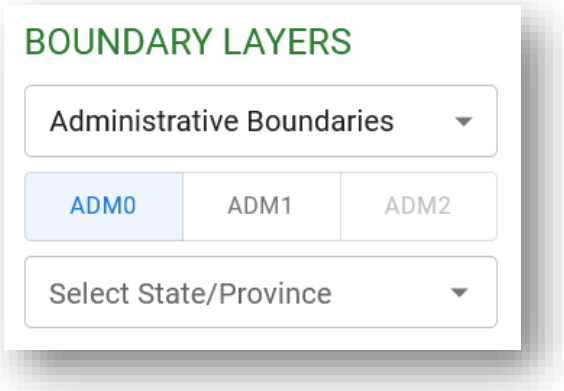


For example, the options selected in this figure, would display on the map the differences between NDVI values on Febuary 2nd, 2023 and February 2nd, 2021.

Adding Boundary Layers

On the **Explore** page you can look at more than just imagery. You can also add boundary layers to the web map both for reference and for basic analysis.

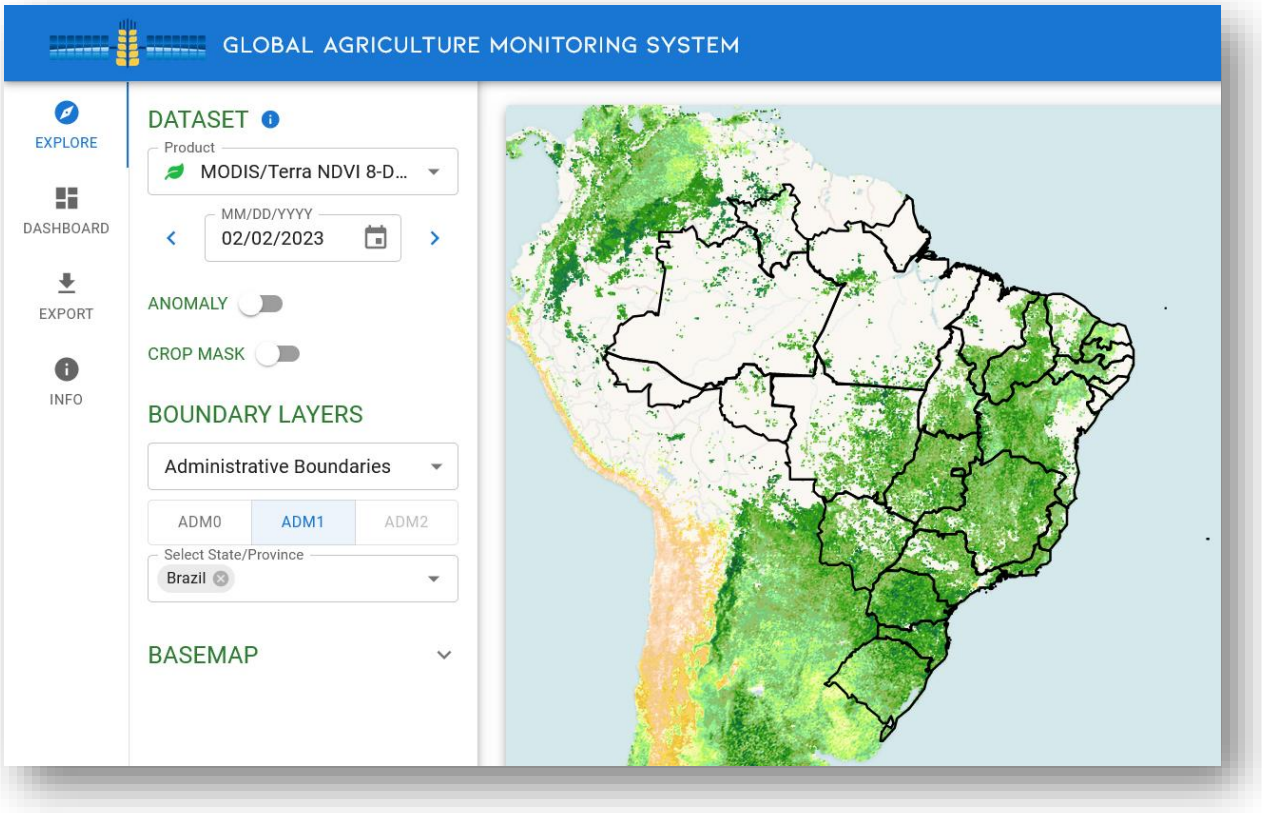
1. To add a boundary layer to the map first select the type of layer from the dropdown menu underneath the **BOUNDARY LAYERS** label. Currently, the only type of boundary layers available are **Administrative Boundaries**, however more layer types may be added in future updates.



2. With **Administrative Boundaries** selected, there are a series of buttons that appear below corresponding to the “level” of administrative boundaries. The first level, **ADM0**, is the national or country level administrative boundaries. The second level, **ADM1**, is sub-national administrative boundaries. And the third level, **ADM2**, is second-order sub-national administrative boundaries. To view, for example, the boundary layer for

the United States of America, you would select **ADM0**. To view the boundary layer for the states themselves, like Maryland, you would select **ADM1**. And selecting **ADM2** would allow you to view the second-order sub-national administrative units which in the U.S. are typically referred to as counties. Each country has their own unique division of sub-national administrative units.

3. Once a level is selected, the dropdown menu below will be populated with layer options. Simply select a layer from the dropdown list and once selected the boundary layer will appear on the map. The example below shows how to select the sub-national (state) boundaries for the country of Brazil.



Note: The administrative boundaries used in this version of the Harvest GLAM system were provided courtesy of geoBoundaries. More information about the geoBoundaries project & datasets can be found at geoboundaries.org. To view, for example, the boundary of

Feature Snapshot

The previous section shows how to add administrative boundaries to the map for reference. However, these boundary layers can also be used for simple analysis by viewing a "snapshot" of available data for a particular administrative unit or boundary feature.

1. Once a boundary layer is added to the map using the instructions outlined above, simply click on feature to launch the **Snapshot** tool.

2. After the feature is clicked a new window will appear showing a "snapshot" of data for a handful products available in the Harvest GLAM system, including products for NDVI, NDWI, Precipitation, and SWI. The **Snapshot** shows the average monthly values for these variables over a user selected duration, with the past 12 months

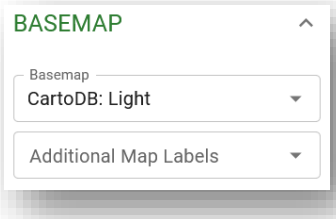


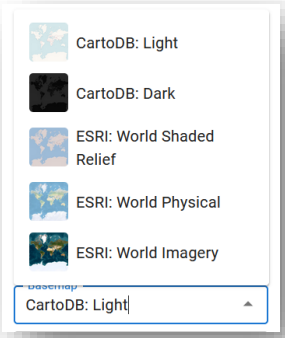
selected by default.
This tool is meant to provide a simple overview of information for a given area. More detailed analysis can be done on the **Dashboard** page.

Map Customization

When viewing different imagery products, it can be helpful to modify the map. The **Explore** page provides a few options for map customization including different basemap options and adding additional map labels.

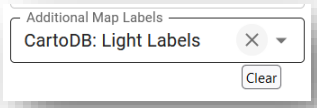
1. To view these options, click on the **BASEMAP** label below the **BOUNDARY LAYERS** section. This reveals two dropdown menus, one for basemaps and another for adding additional map labels.

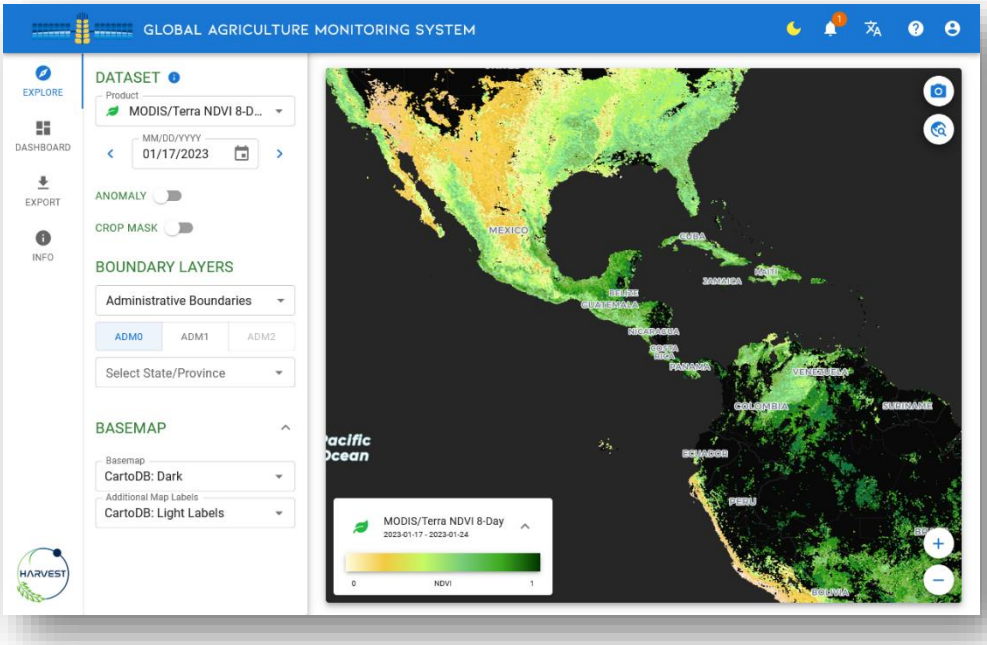




2. Click on the basemap dropdown menu to reveal a list of available basemap options. Each option has a small thumbnail to get a sense of the basemap. Click on a basemap option and the web map will automatically update with the newly selected basemap.

3. Similarly, clicking on the additional map labels dropdown menu will reveal map label options. Once an option is selected, labels will be added to the web map. These labels can be removed by un-selecting the label option or clicking the X button that appears on the dropdown menu if a label option is selected.

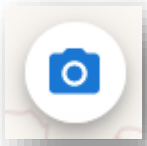




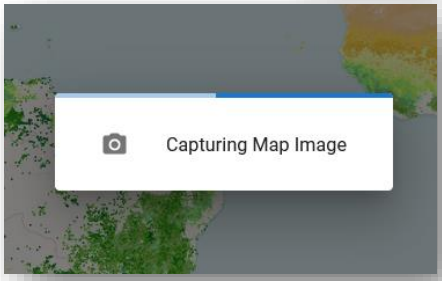
The example above shows a web map with a dark basemap and light labels.

Capturing an image of the map

The web page on the Explore page offers a quick way to capture and download an image of the map you are viewing.



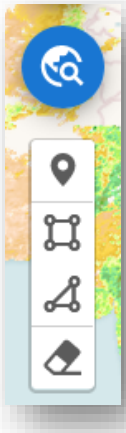
1. To capture an image of the map, navigate to the top right corner of the map and find the camera icon.



2. When satisfied with the imagery and area covered by the map, click the camera icon to capture an image. You will see a notification that an image is being captured and then your web browser will download the image.

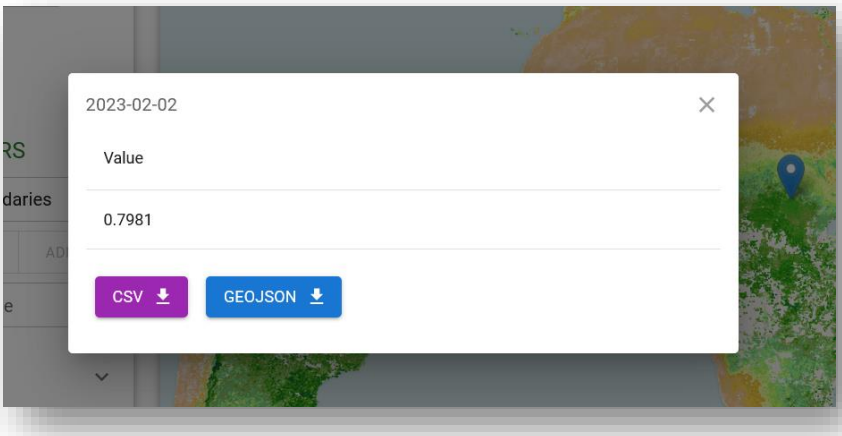
Querying the map

The final tool found on the Explore web map allows a user to query values from the imagery that is being viewed



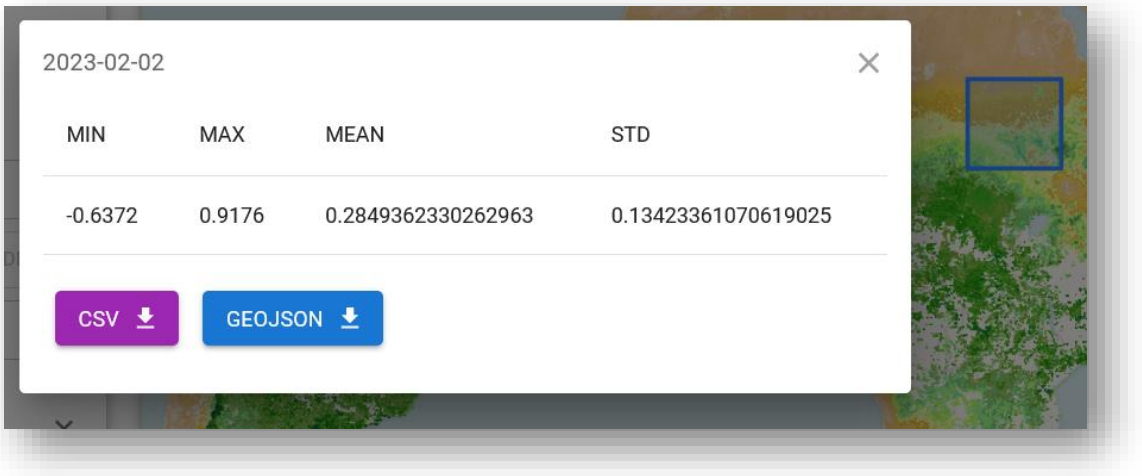
1. Below the camera icon you will find a button with an icon of a magnifying glass atop a globe. Clicking this button will reveal a menu of additional buttons that can be used to query the map

2. The first button is a map marker. Clicking this button will allow you to place a marker on the map to query a single point (latitude &

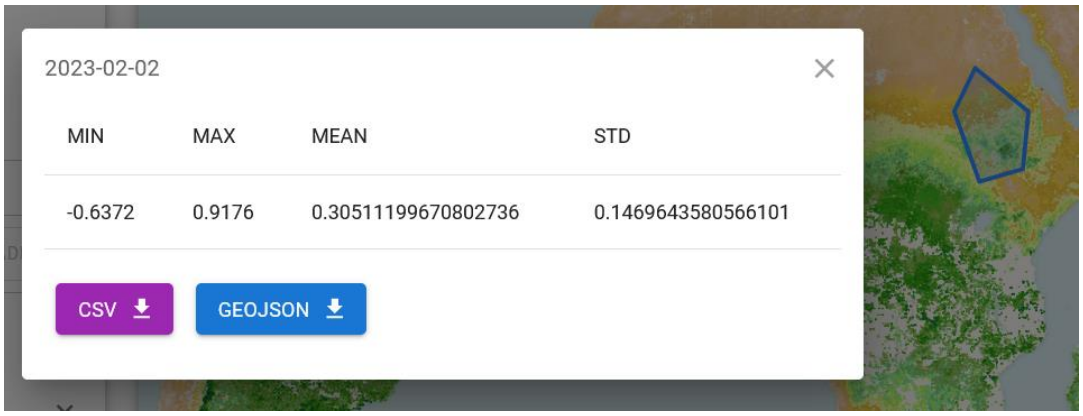


longitude). Once the marker is placed, the tool queries the image currently displayed and shows the resulting value in a new window.

3. The second button allows you to draw a square on the map. Once you finish drawing the square, the image is queried and the MIN, MAX, MEAN, and STD (standard deviation) of the area covered by the square are returned in a new window.



4. The third button allows you to draw a polygon with your desired number of vertices. Place the vertices of your polygon and to complete the shape click on the first vertex that was placed. Much like the square tool, the image will be queried using the geometry of the shape provided and will return the **MIN, MAX, MEAN,** and **STD** of the area covered by the shape.



Note: In each of these examples the resulting values can be downloaded as a CSV or a GeoJSON file which includes both the geometry of the shape or marker drawn on the map and the resulting values from the query.

5. The last button with the eraser icon allows you to delete any shape or maker that is drawn. However, you do not need to remove a shape or marker before you draw

another one. Simply draw a new shape or place a new marker and the previous one will be removed

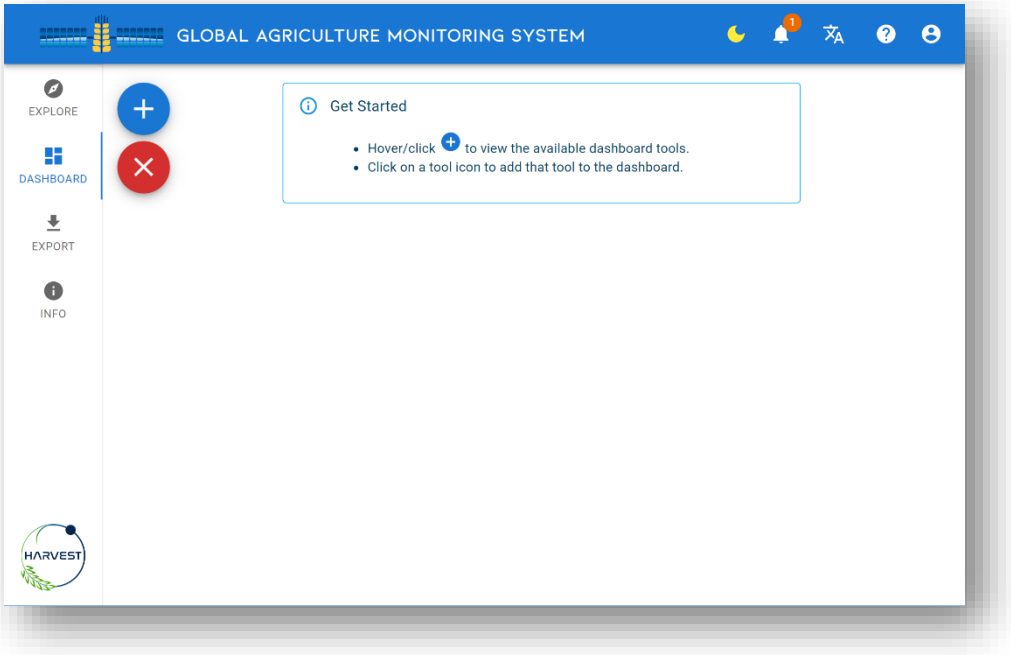
6. Click the map query button again (magnifying glass & globe icon) to remove the drawing tools and any remaining shape or maker on the map.

Part 2: Analyze

The Dashboard Page allows users to conduct different types of analysis using data derived from satellite imagery.

(To open the **Dashboard** Page, click **Dashboard** on the left side panel.)

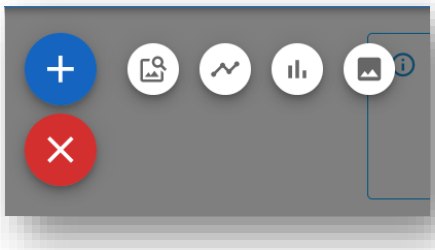
Dashboard Overview



When the **Dashboard** page is opened, you will see a mostly empty page, with the exception of some buttons and some brief instructions of how to start using the **Dashboard** and its tools.

Adding a Tool

1. To get started using the **Dashboard**, you mush first add a tool. To select a tool and add it to the Dashboard, hover over or click the blue button with the + icon. If you are using the application on a desktop computer the button will appear at the top left of the page. On smaller devices it will appear at the bottom right of the page.



2. After hovering over or clicking this button, a menu of other buttons will appear, these correspond to the available tools that can be added to the dashboard.

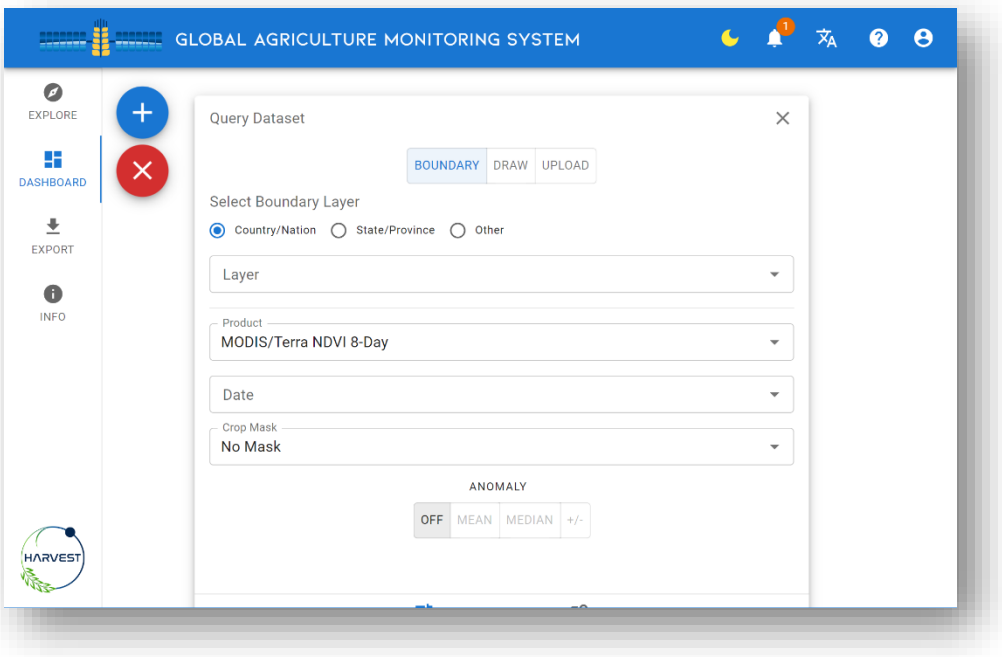
   There are currently four Dashboard Tools:

   - Query
   - Time-Series
   - Histogram
   - **Graphic**

Note: More tools will be added to the Dashboard in future application updates.

3. Click on one of these buttons to add the corresponding tool to the Dashboard.

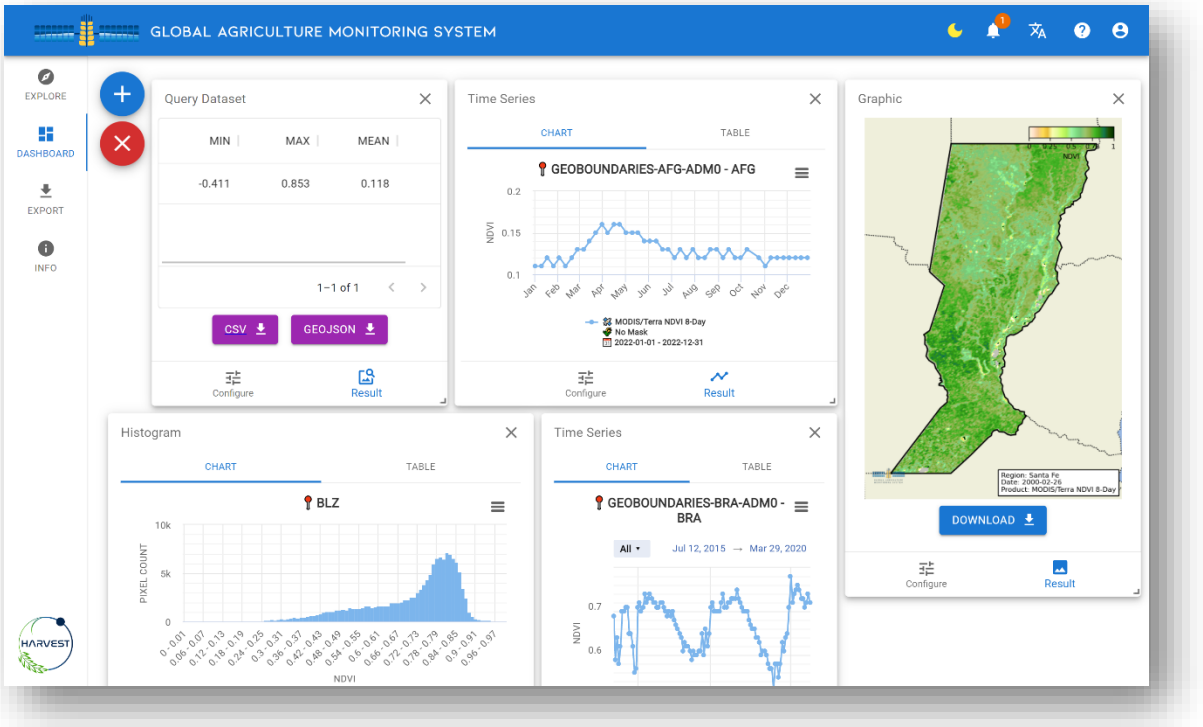
Note: Multiple tools can be added to the Dashboard, and multiple of the same type!



4. After clicking one of the tool buttons, a tool window will appear on the page.

   These tool windows added to the Dashboard page are resizable and movable. This means you can create any combination or order of tools on the dashboard page. These tools also operate independently of each other. Meaning you can conduct analysis using different data or different areas all within the same page.

Below shows an example of how multiple tools can be added to the Dashboard. The tool windows can be resized or moved to be as small or as large as you prefer.



Removing a Tool

1. To remove a single tool, simply click the X button at the top right of the tool window that you wish to remove.

2. If you would like to remove all tools and empty the Dashboard page, click the red X button just below the blue + button.

Selecting an Area for Analysis

In each dashboard tool, you will be required to select an area to conduct analysis using the tool. This area of analysis can be selected in one of three ways.

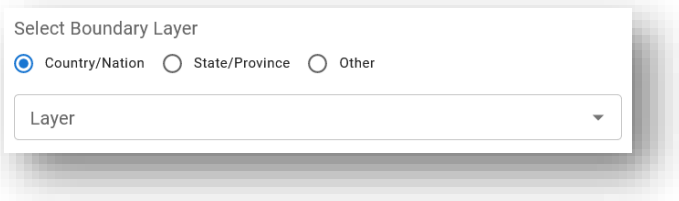
1. Selecting from a list of administrative boundaries.
2. Drawing your own area on a map.
3. Uploading a GeoJSON of the area.

For each tool added to the Dashboard, there will be a row of buttons at the top, allowing a user to change which method they prefer.



Administrative Boundaries
Much like selecting a dataset in the **Explore** page, you are able to select an area of analysis for a dashboard tool from a list of administrative boundaries.

By default, when a tool is added, the **BOUNDARY** method will be selected. When this method is selected there will be a menu of options that appear below labeled **Select Boundary Layer.**



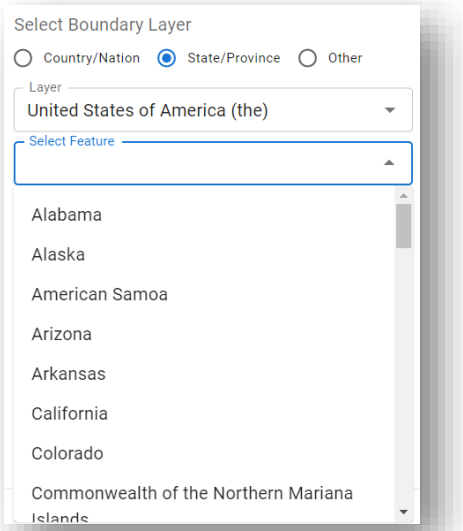
1. The first options available let the user select the administrative level. The primary options are the **Country/Nation** level (ADM0) and the **State/Province** level (ADM1). Additional layers may be available by selecting the **Other** option.

2. When one of these options is selected, the dropdown menu(s) below will update.

3. With the **Country/Nation** option selected, simply select your desired country from the dropdown menu below.

4. With **State/Province** selected, two dropdown menus will appear. In the first dropdown, select the country or nation to which the province/state belongs. Then in the second dropdown select your desired province/state.

   This example shows selecting sub-national administrative boundaries for the United States of America. In the first dropdown menu the country is selected (U.S.) and the second provides a list of sub-national administrative units, which in this case are called states.



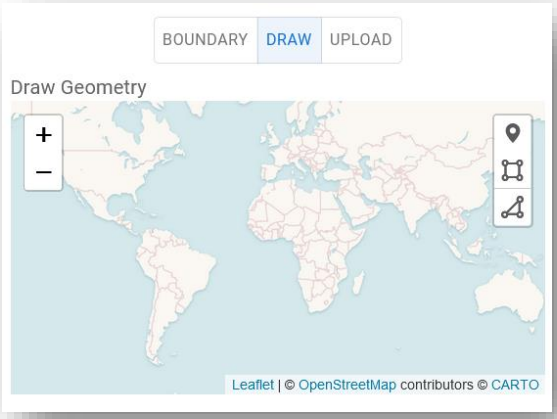
User Created Geometry (Draw Your Own)

The second method to select an area for analysis using a dashboard tool is to draw your own feature on a web map.



1. First select the **DRAW** method from the menu of buttons at the top of the tool.

2. Once selected, a small web map will appear within the tool window. This map contains the same drawing tools used in the query tool on the **Explore** page web map. Like with that tool, your options are to place a marker on the map to specify a point location (latitude & longitude), draw a square/rectangular area, and draw a shape with any number of vertices.



3. Zoom and pan to your desired area on the map, then draw a shape or place a marker over your desired area to conduct analysis. If you draw a shape and are not satisfied with it, simply begin to draw a new shape and the previously drawn one will be removed from the map. If necessary, continue to draw a shape or place a marker until satisfied with the result.

4. Once satisfied complete the rest of the tool specific options below.

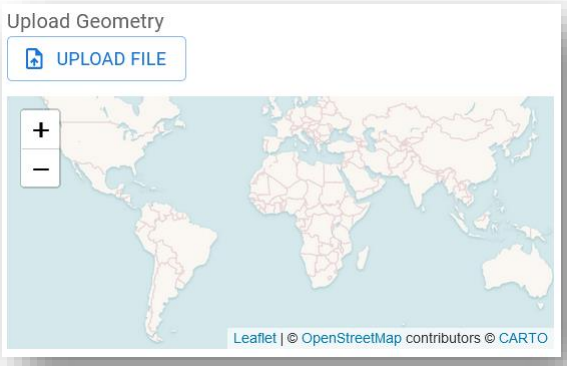
User Uploaded Geometry

The last method to select an area for analysis using a dashboard tool is to upload your own geometry using a file. Currently, the only support file format for this method is GeoJSON. However, additional file formats for geospatial vector data like ESRI Shapefile or KML may be added in future application updates. For more information about the GeoJSON file format please visit geojson.org.

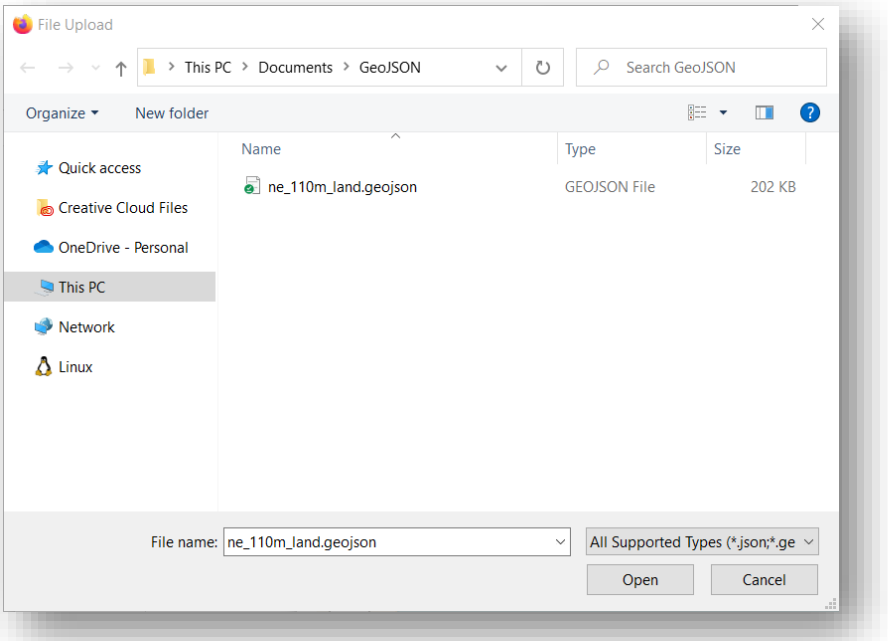


1. To upload your own geometry file, first select **UPLOAD** from the menu of buttons at the top of the tool

2. Once this option is selected, a button and small web map will appear within the tool window.

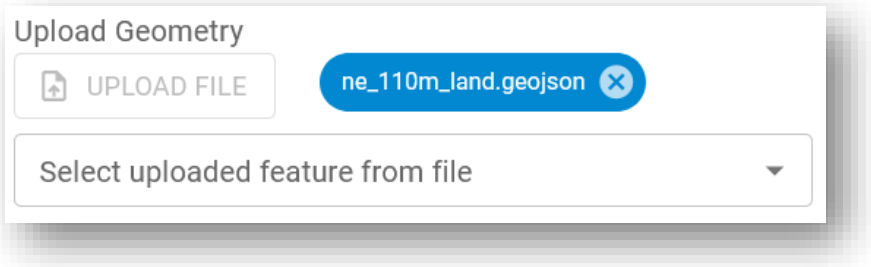


3. Click the **UPLOAD FILE** button.
   A new window will appear, prompting you to select a file from your file system. If you are using a Windows operating system, this window might look like the example below.



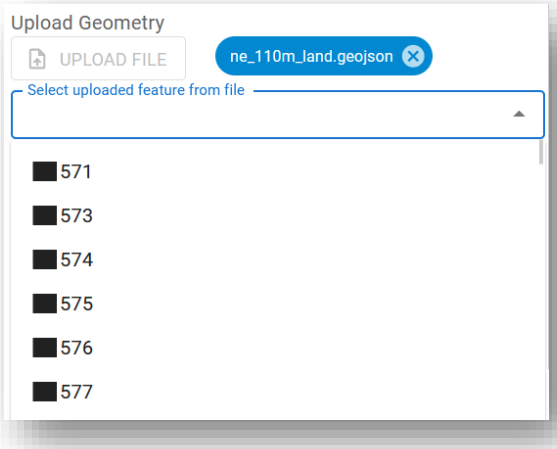
4. Select the file from your file system that you would like to use and click Open.

5. When you have successfully selected a file, the file name will appear next to the **Upload File** button. A dropdown menu will appear below it.



6. Use the dropdown menu to select the feature from the file that you would like to use for analysis. Depending on your file, you may see a list of many features or just one.

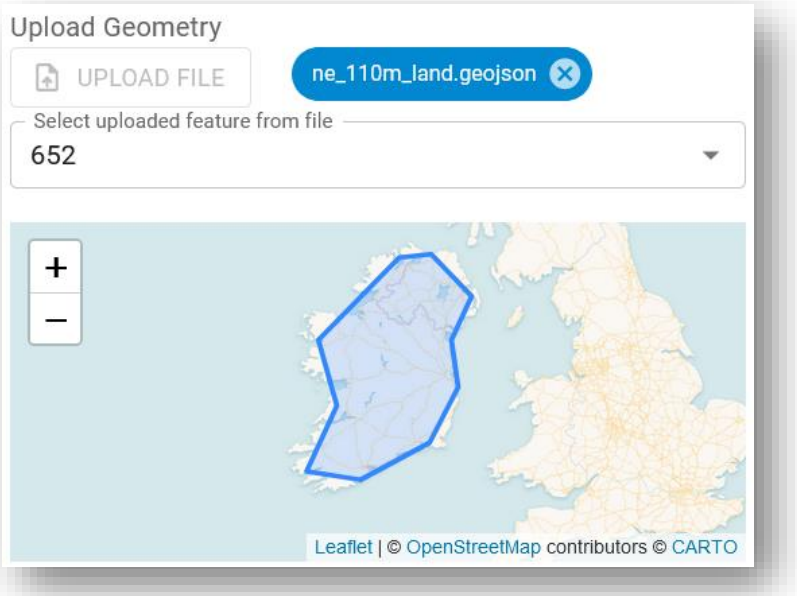
   Features in this list will be identified by the feature ID found in the GeoJSON file.



7. Select the feature from the list, and it will be displayed in the map below so you can confirm that this is the area you would like to use for your analysis.

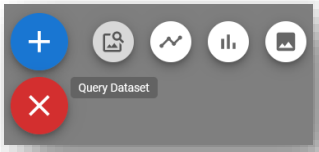
8. Once satisfied with your selected feature you may proceed with the rest of the tool options.

9. To remove the uploaded GeoJSON file, and select a new file for analysis, click the X that appears next to the file name of the uploaded file. This will remove the file and all of its features from the tool.



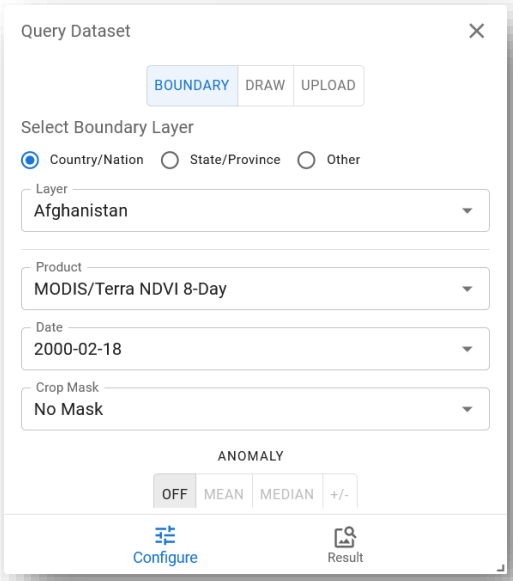
Query Tool

The first Dashboard Tool option is the Query Tool. The Query Tool is similar to the Query Tool found on the web map on the **Explore** page. The tool returns values extracted from a particular imagery dataset. The values can be from a single point location or the minimum, maximum, mean, and standard deviation of values across a geographic area.



1. To add the Query Tool to the Dashboard, click the button with an icon showing a magnifying glass over an image.

2. Select your area of analysis using one of the three methods previously outlined in this guide.



3. Select the imagery product you would like to query.

4. Select the imagery date.

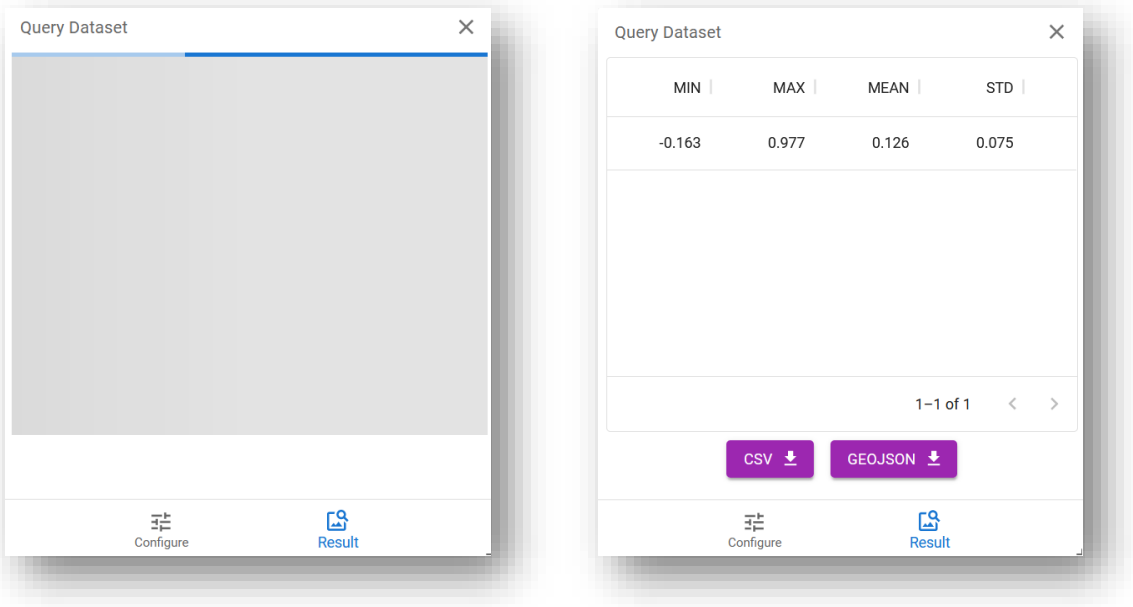
5. Select from a list of available crop masks if you would only like to query data present in crop areas identified in a particular mask.

6. Optionally you may also use the Anomaly options to query the difference in imagery values for the selected date and the mean or median values over a period of time. These Anomaly options are similar to those in the **Explore** page for imagery visualization.

7. Once satisfied with the options selected for Product, Date, Mask, and Anomaly, click on the **Result Tab** identified by the same Query Tool icon at the bottom right of the tool window.

8. When clicked, the tool window will show a loading indicator while the image is being queried, and when the query is complete, the results will be displayed in a table.

9. The values in the resulting table can be downloaded as a CSV file by clicking the button labeled **CSV** or as a GeoJSON file by clicking the button labeled **GEOJSON**



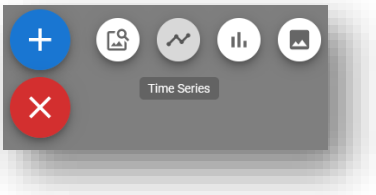
The examples above show a loading indicator while an image is being queried and the final output of values in the resulting table

10. To perform additional queries, click the **Configure** tab to return to the Query Tool input options and change the values as you see fit.

Time Series Tool

The next Dashboard Tool option is the Time Series Tool. Use this tool to create a time series chart displaying imagery values for a particular area over time. The values can be derived from a single point location or the mean value over a geographic area.

Note: For the Time Series tool, values for Administrative Boundaries are precalculated and stored in the Harvest GLAM system database for quick retrieval, as we have found that these boundaries fit most user's needs for analysis. When selecting an area for analysis using the drawing method or by uploading a file, values are calculated "on-the-fly". As such, these methods may take a longer amount of time depending on the duration specified for the time series analysis.



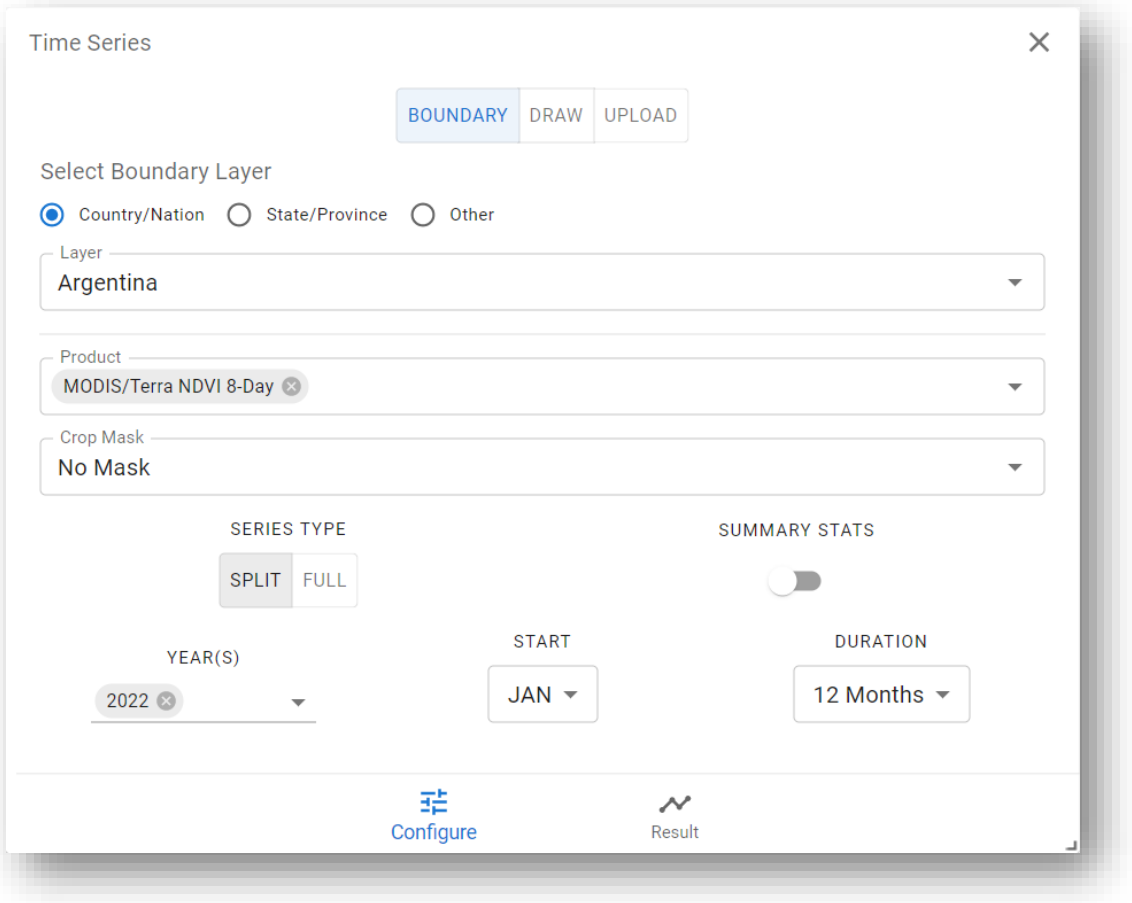
1. To add the Time Series Tool to the Dashboard, click the button with an icon depicting a line graph.

2. Select your area of analysis using one of the three methods previously outlined in this guide.

3. The Time Series Tool includes many options. The following steps illustrate a simple example.

Simple Time series

4. For a simple analysis ensure that **No Mask** is selected. Optionally, you may select a crop mask to only chart data from areas identifies by the selected mask.



5. For the **SERIES TYPE** option, ensure that **SPLIT** is selected**.**
   This option plots a series for each year of data requested.

6. Leave the **SUMMARY STATS** toggle off.

7. Select a single year from the **YEAR(S)** dropdown.

8. Leave **JAN** as the **START** month.

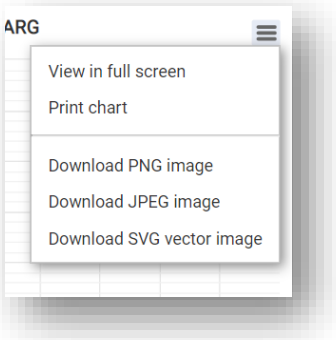
9. And leave the **DURATION** for the time series as **12 Months**.

10. Click on the **Result Tab** at the bottom right of the tool window identified by the Time Series tool icon. A loading indicator will appear while time series values are queried.

11. After the data has loaded, the output will appear in the form of a time series chart, with values from a single year (2022 in this is example) plotted starting in January and ending 12 months later at the end of December.

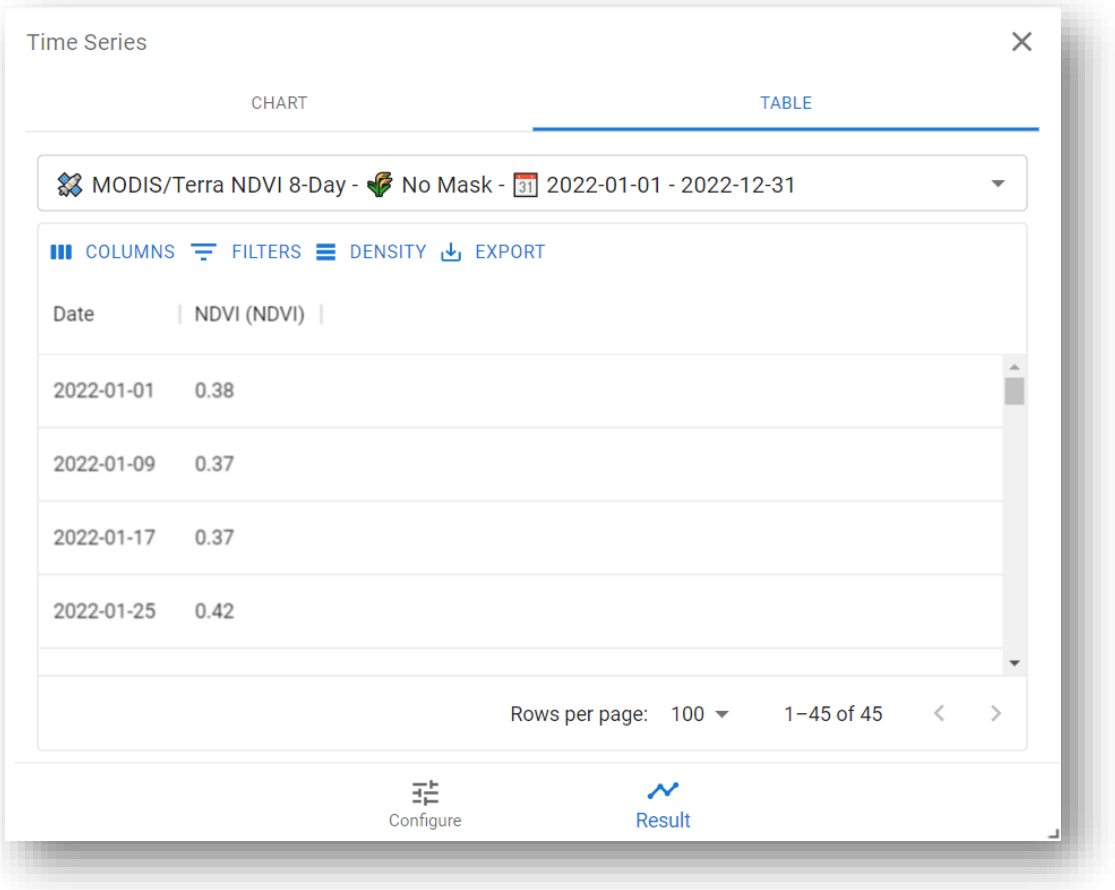


Note: The charts generated in the Time Series tool and other Harvest GLAM tools are interactive, meaning you can hover over the chart to view values and additional information.



These charts can also be printed or downloaded as an image for later use. Click on the menu button at the top right corner of the chart to reveal a list of options.

12. After opening the **Result Tab**, two more tabs appear at the top of the tools window. The first is labeled **CHART** which is selected by default, and the second is **TABLE**. This tab can be clicked to view the data behind the resulting chart in tabular format.



13. The data can be viewed in the table and exported as a CSV file by clicking the **EXPORT** button at the top of the table.

Multiple Years

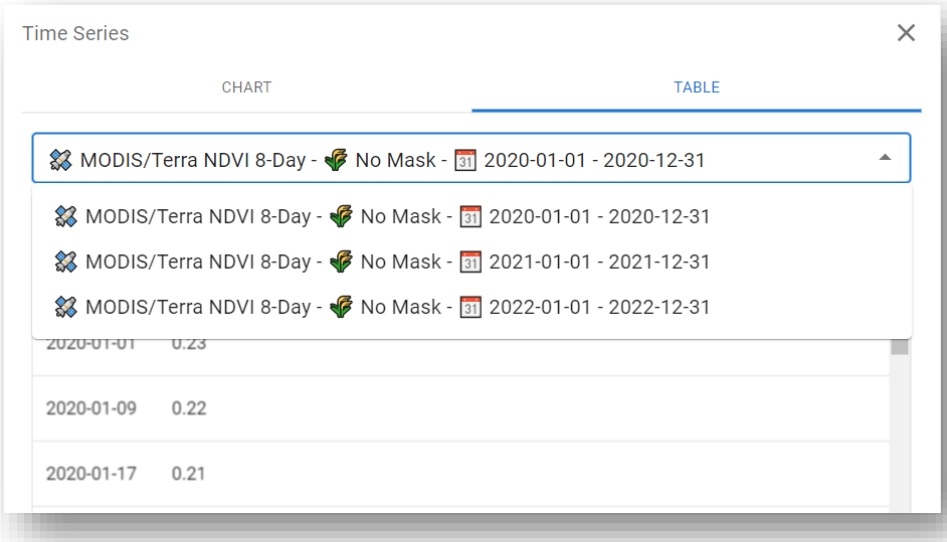
This is a simple example of creating a chart using the Time Series tool to examine values for a single product over the course of a year. What if you want to compare one year to another? Or many years?

1. Click on the **Configure** tab to return to the Time Series tool options.
2. You can use the **YEAR(S)** dropdown menu to select multiple years.
3. Keep all other options the same as before and click on the **Result Tab.**

4. After the chart loads, we can now see each year of data as an individual series on the chart over the same 12-month duration.



5. Navigating to the **TABLE** tab, the data for each series can be viewed as its own table. To change which series to view in the table, select a series from the dropdown menu above the table.



Continuous Series

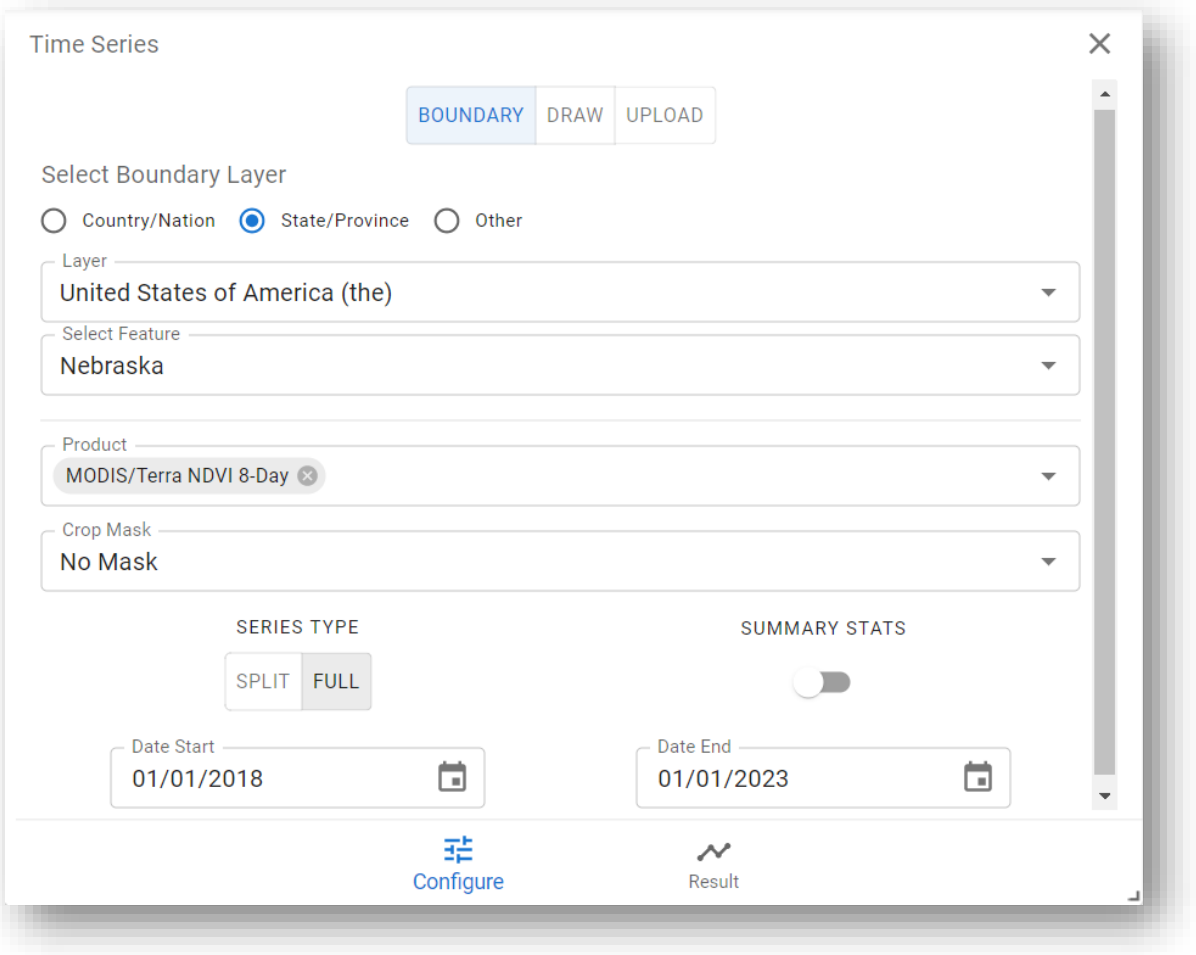
Instead of viewing each year as a series on the chart, perhaps you would prefer to view the data as one continuous series. To create a chart like this:

1. Click on the **Configure** tab to return to the Time Series tool options.

2. Change the **SERIES TYPE** option to **FULL.**

3. After this is selected, new options will appear below.

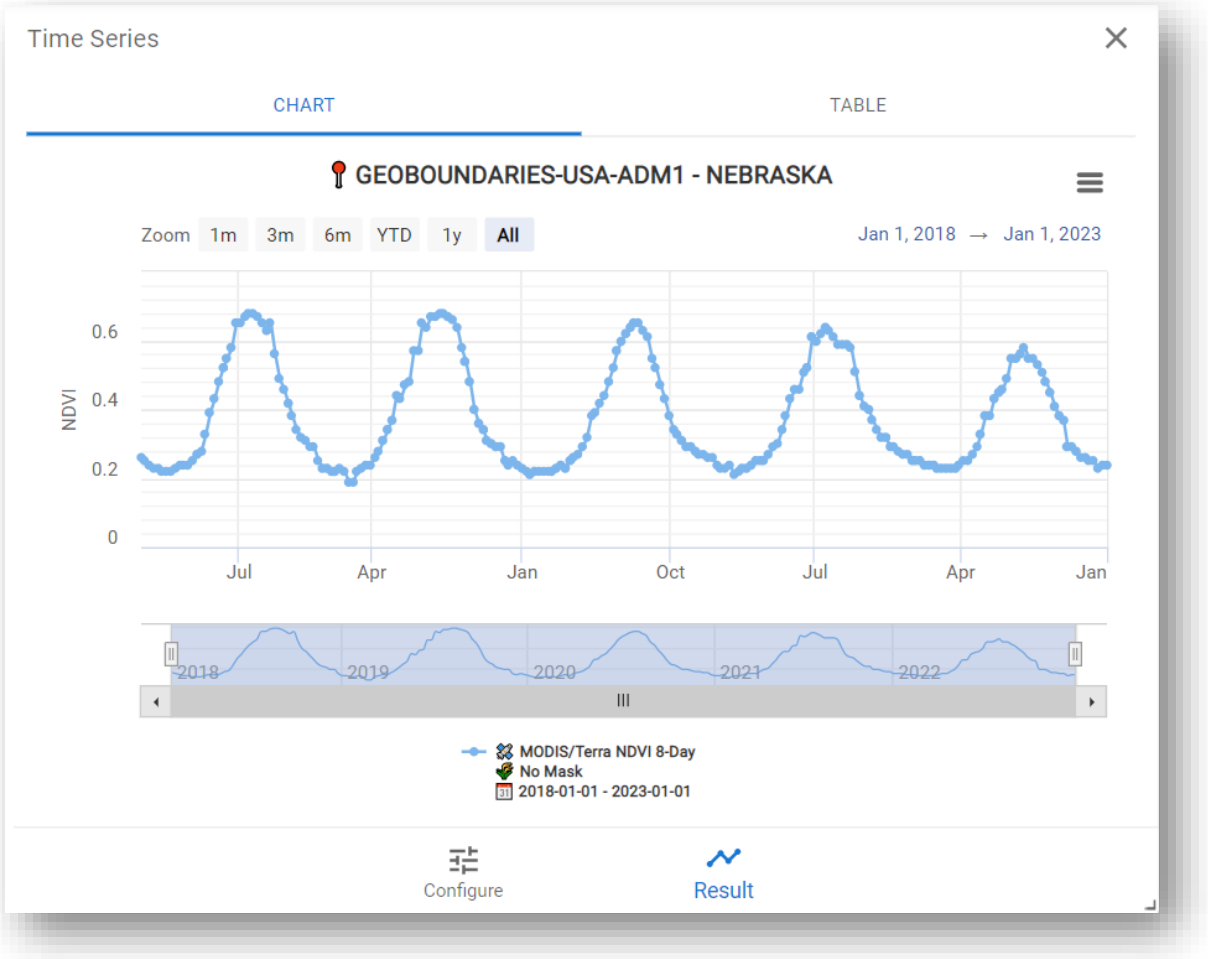
   Two calendar inputs will appear. One is used to select a series start date and one is for a series end date.



4. Use the calendar inputs to select a start and end date. Either type your preferred dates into the box or click the calendar icon to open the calendar and select a date.

5. When satisfied with the date input, click the **Result Tab.**

6. The resulting chart displays all data within the time range specified as a continuous series.



The chart also has additional options to zoom into different intervals within the series.

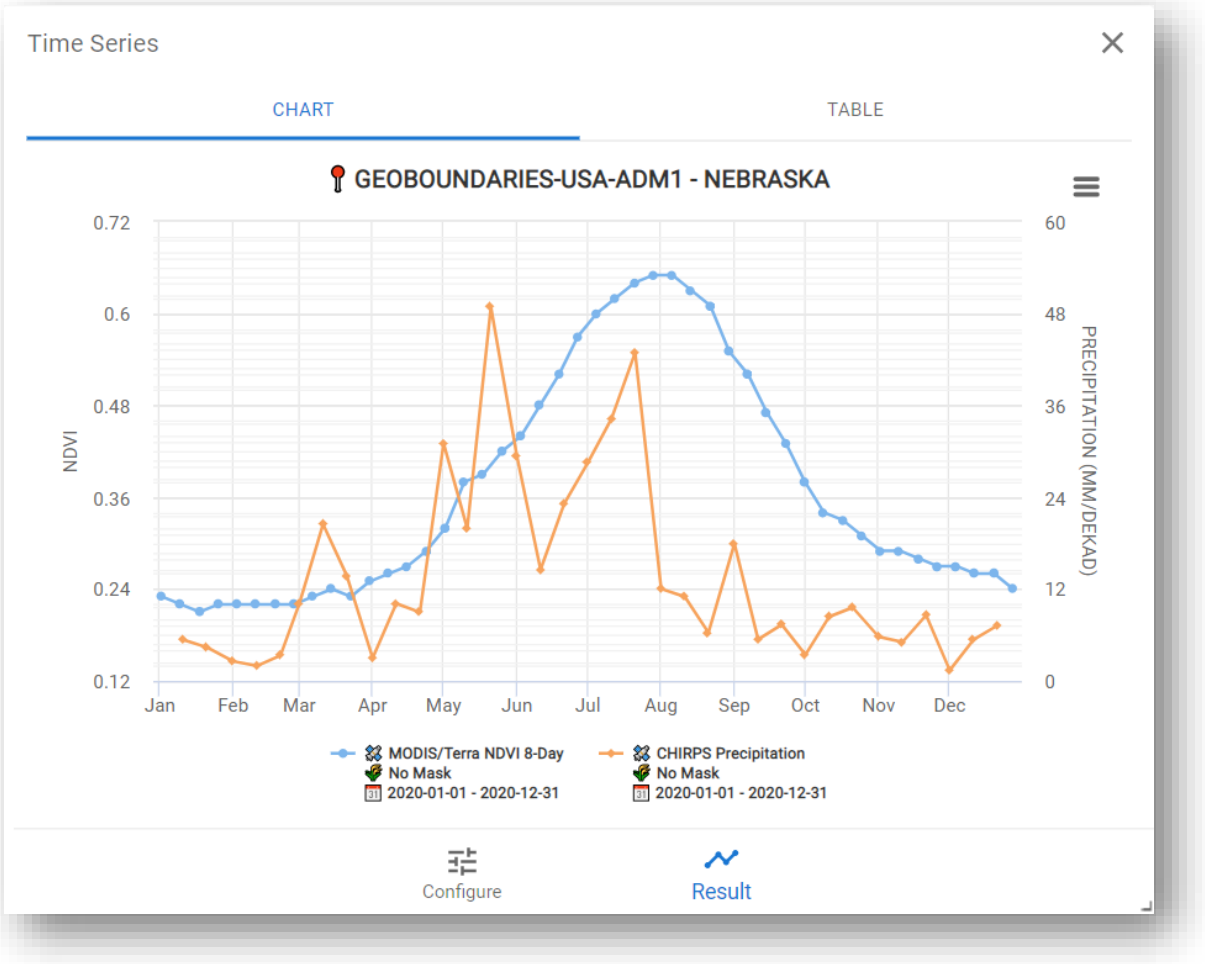
Charting Multiple Products

The Time Series Tool also enables you to compare different imagery products on the same chart. For example, you can plot a series of NDVI and a series of Precipitation data for the same time period.

1. Click on the **Configure** tab to return to the Time Series tool options.

2. In the **Product** dropdown menu, select the products that you would like to compare. For this example, we will select MODIS/Terra 8-Day NDVI and CHIRPS Precipitation

3. When satisfied with the date input, click the **Result Tab.**



4. A new axis will be added to the chart for the new variable. In this example the NDVI values are on the left Y-Axis and the precipitation values (mm/dekad) are found on the right Y-Axis.

Summary Statistics

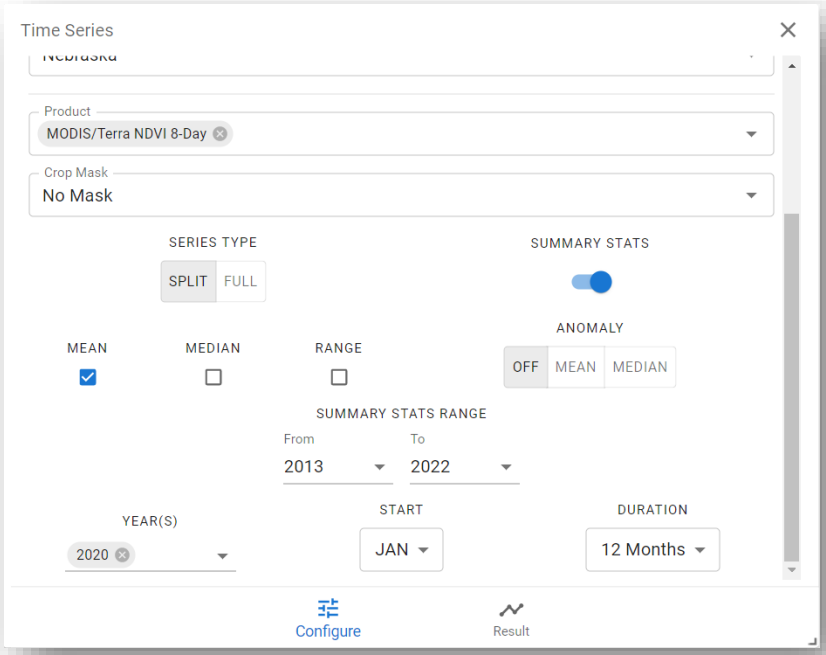
Finally, the Time Series tool also allows you to compare a time series of imagery data to summary statistics like **Mean, Median,** and **Minimum** & **Maximum** values.

1. To start, click on the **Configure** tab to return to the Time Series tool options.

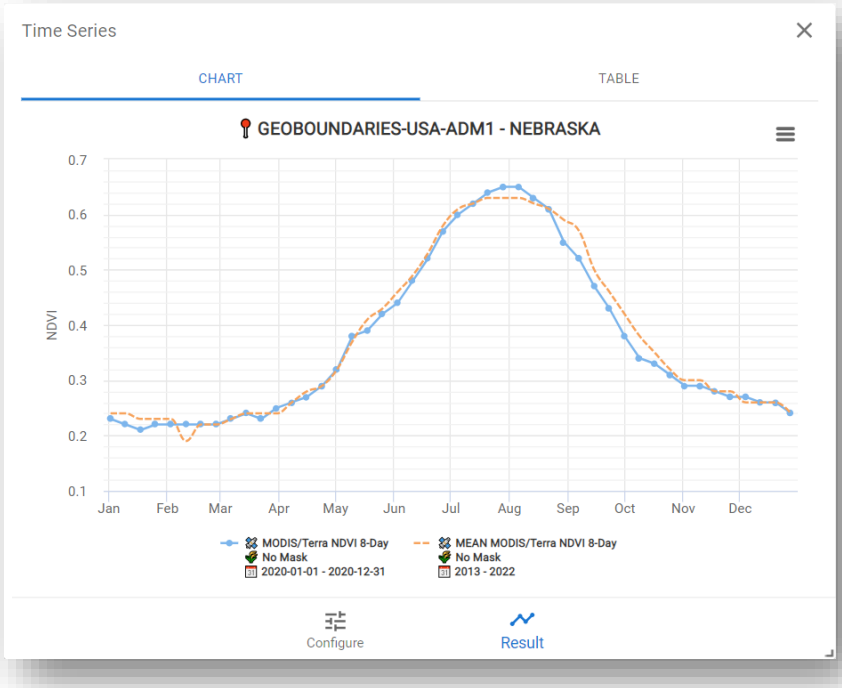
2. Toggle on the **SUMMARY STATS** switch to reveal the various summary series that can be added to the chart.

3. To start with a simple example, check the box labeled **MEAN**

4. Then select a time range to calculate the summary statistics. In this example, we will chart the mean for values from 2013 - 2022 for the product selected.

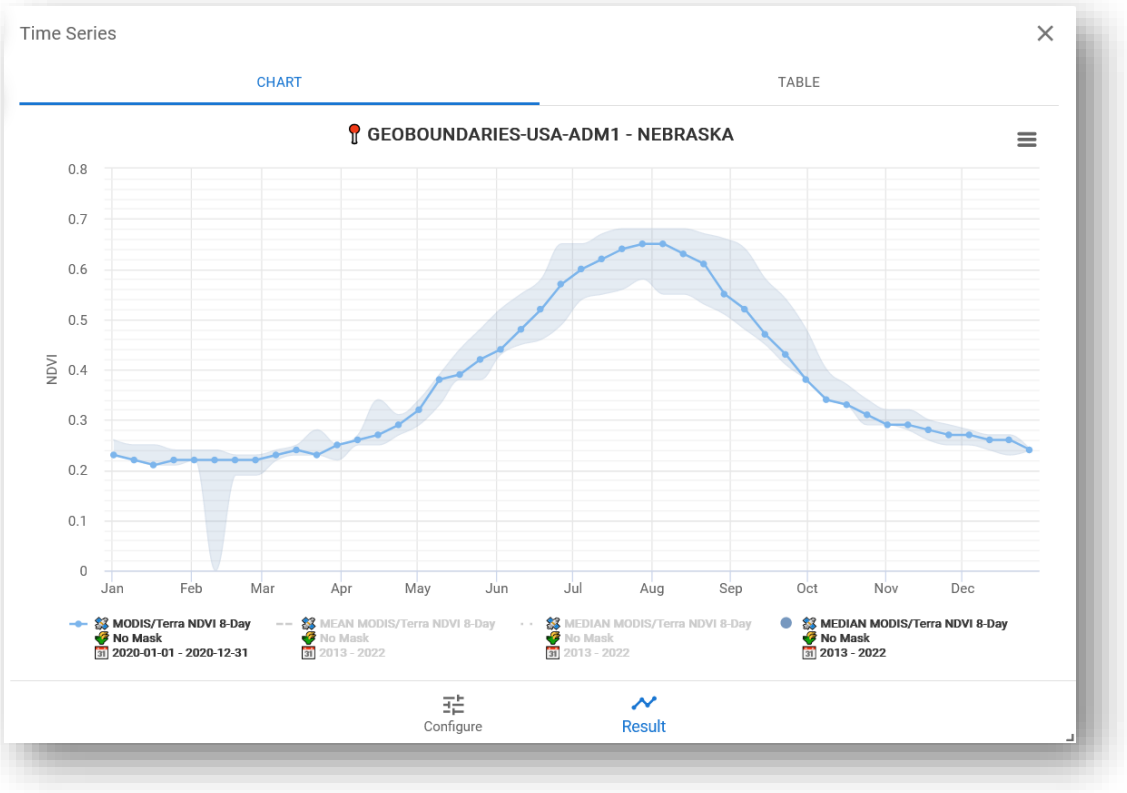


5. If satisfied with the rest of the options, click the **Result Tab.**



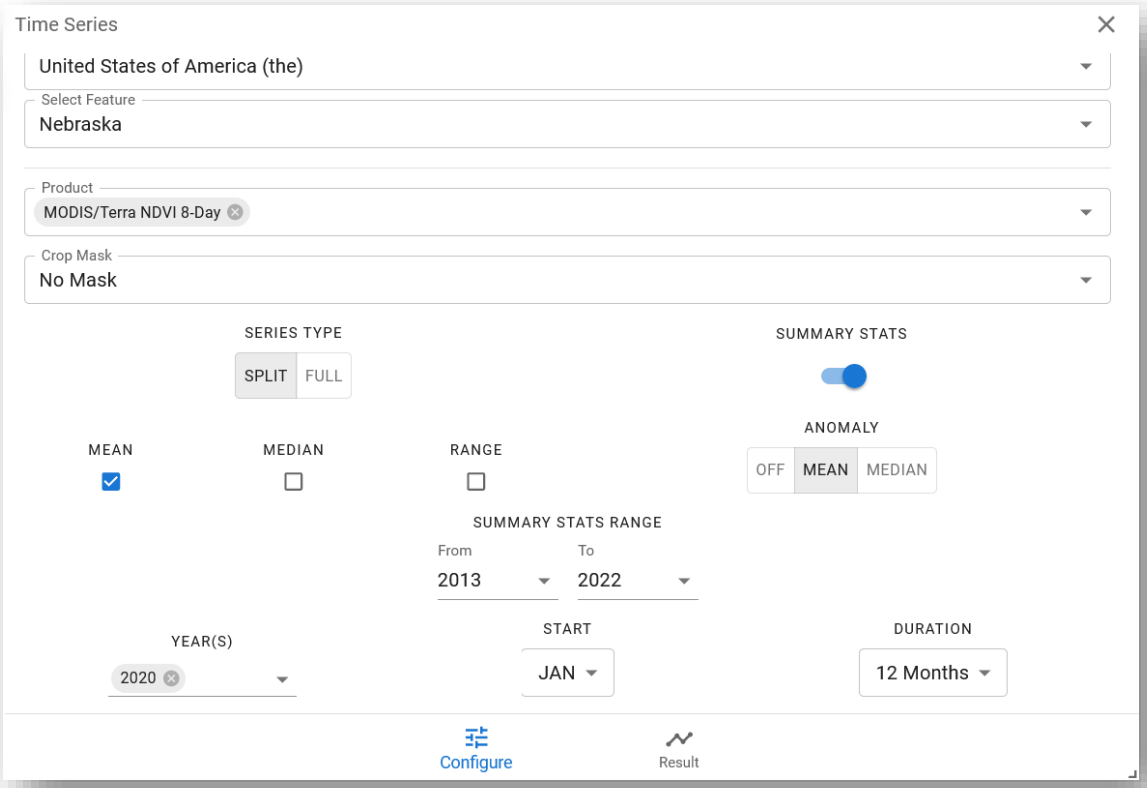
6. The chart will now display an additional series, showing the mean values (dashed line).

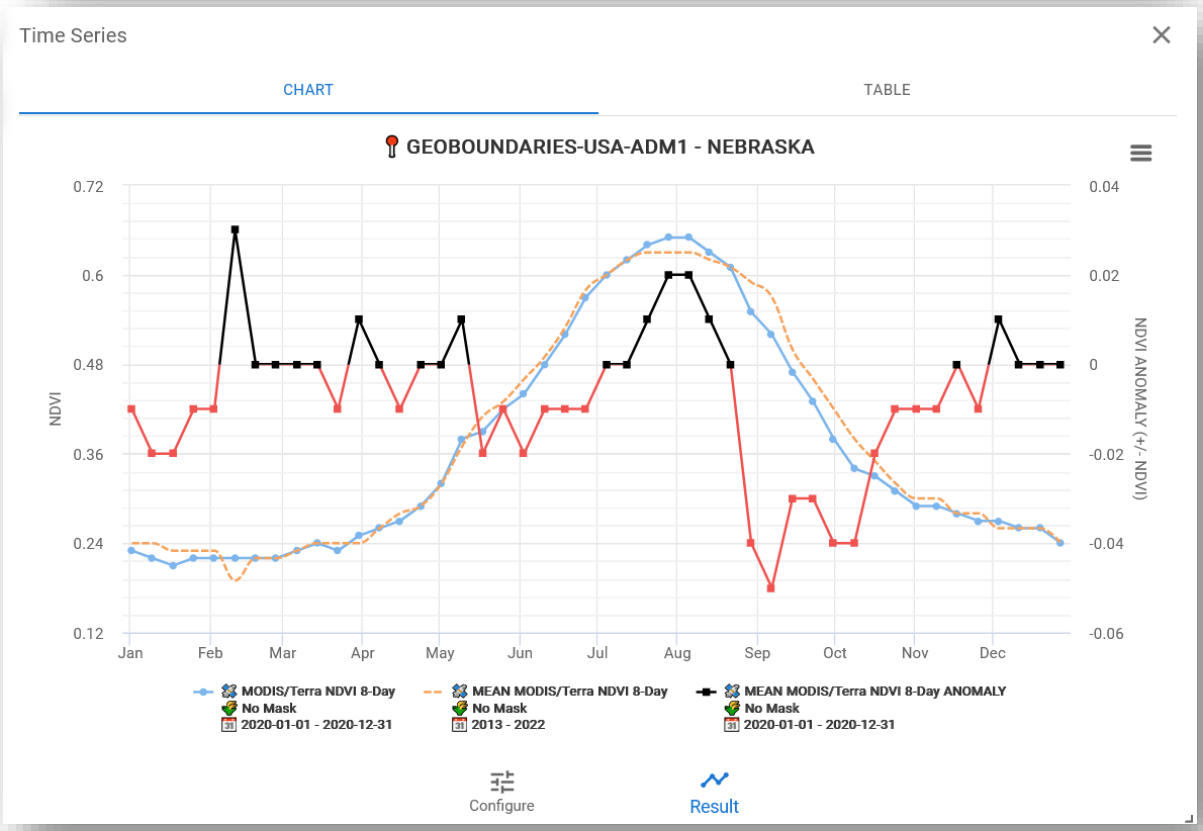
7. The same process works to display the **MEDIAN** and **RANGE** (minimum and maximum values). The example below shows how the **RANGE** is displayed as an area range on the chart. You can use this to compare how a single year's values (2020 in this example) compart to the low and high values over a certain time period (2013-2022 in this example).



8. The last **SUMMARY STATS** option is **ANOMALY**. Use this tool to see the difference between a series of values and the mean or median values for each date over a specified time range.

   In the following example we will check the box labeled MEAN and also select **MEAN** under the **ANOMALY** option. For the **SUMMARY STATS RANGE** we will continue to use 2013-2022 to calculate the mean for a 10-year period. To keep things simple we will select a single year, 2020, and keep the other series options the same.

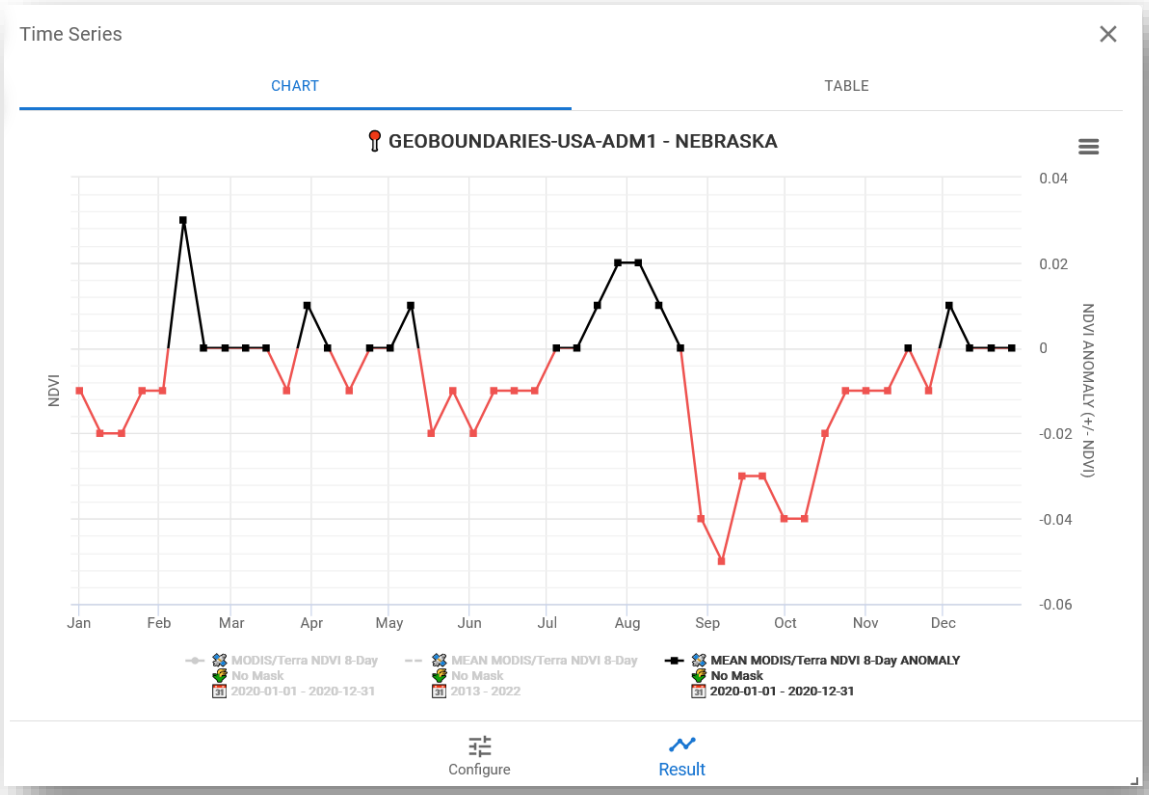

Time Series
United States of America (the)
Select Feature
Nebraska
Product
MODIS/Terra NDVI 8-Day
Crop Mask
No Mask
SERIES TYPE
SPLIT
FULL
SUMMARY STATS
MEAN
MEDIAN
RANGE
ANOMALY
OFF
MEAN
MEDIAN
SUMMARY STATS RANGE
From
2013
To
2022
YEAR(S)
2020
START
JAN
DURATION
12 Months
Configure
Result


Time Series
CHART
TABLE
GEOBOUNDARIES-USA-ADM1 - NEBRASKA
NDVI
NDVI ANOMALY (+/- NDVI)
0.72
0.6
0.48
0.36
0.24
0.12
0.04
0.02
0
-0.02
-0.04
-0.06
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
MODIS/Terra NDVI 8-Day
No Mask
2020-01-01 - 2020-12-31
MEAN MODIS/Terra NDVI 8-Day
No Mask
2013 - 2022
MEAN MODIS/Terra NDVI 8-Day ANOMALY
No Mask
2020-01-01 - 2020-12-31
Configure
Result

9. The resulting chart will now show three different series:1) our data for the year 2020, 2) the **MEAN** values for this date range for 2013-2022, and 3) the **ANOMALY** of the 2020 data from this mean. An additional Y-Axis is added to the chart, specifically for the **ANOMALY** values – in this case +/- NDVI.

10. In instances like this, or when multiple years/products are plotted on the chart, it can be useful to "turn-off" a series, or temporarily remove it from the chart for clarity.

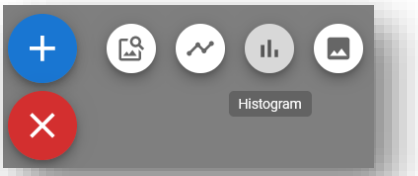
    To do this simply click on the name of the series that you would like to "turn-off" in the legend below the chart. In the following example, the series for 2020 and the mean are both removed to just show the anomaly by itself. We can now see more clearly how 2020 values differed from the 10-year mean.



Simply click on these series again in the legend to turn them back on.

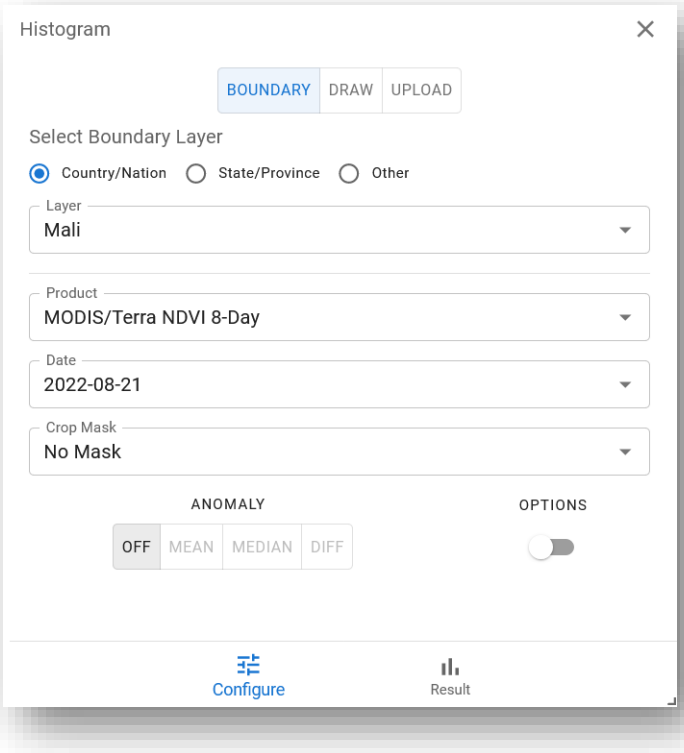
Histogram Tool

The next Dashboard Tool option is the Histogram Tool. Use this tool to create a histogram chart depicting the distribution of values in a particular image. The values are extracted from the area of analysis specified using the available methods.



1. To add the Time Series Tool to the Dashboard, click the button with an icon depicting a bar graph.

2. Select your area of analysis using one of the three methods previously outlined in this guide.



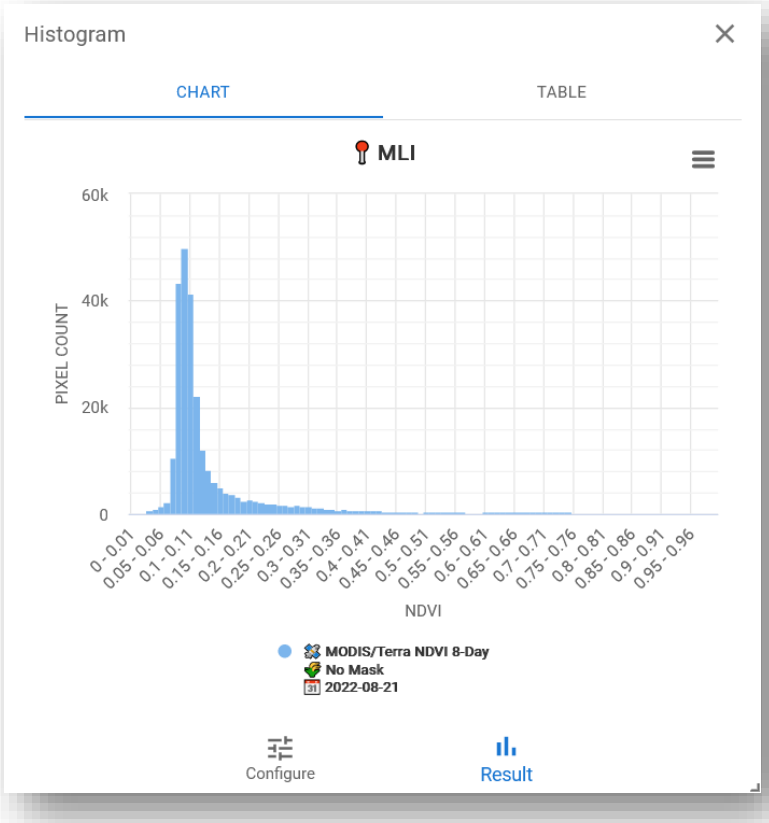
3. Select the imagery product you would like to query.

4. Select the imagery date.

5. Select from a list of available crop masks if you would only like to query data present in crop areas identified in a particular mask.

6. Optionally you may also use the Anomaly options to query the difference in imagery values for the selected date and the mean or median values over a period of time. These Anomaly options are similar to those in the **Explore** page for imagery visualization.

7. Once satisfied with the options selected for Product, Date, Mask, and Anomaly, click on the **Result Tab** identified by the same Histogram Tool icon at the bottom right of the tool window.

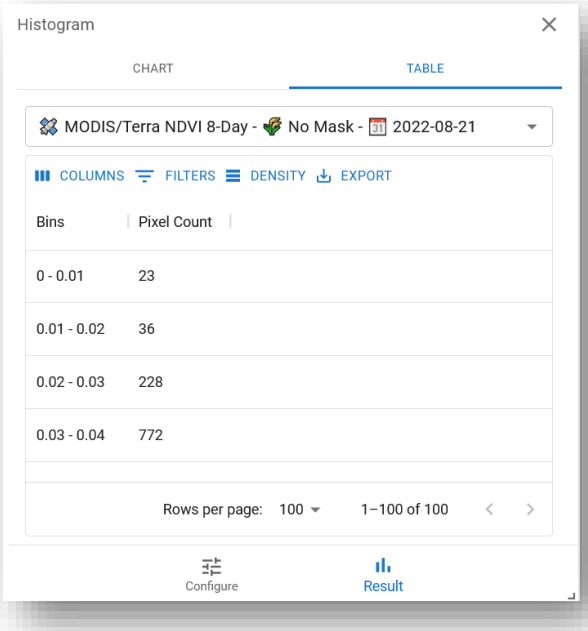


8. By default, the resulting chart displays the number of pixels in the imagery that fall within the different "bins" of values.

   In this example, the histogram chart shows us that for the country of Mali on August 21st, 2022, most NDVI values were between 0.05 and 0.2.

   Like the **Time Series Tool,** we can also view the resulting values in table form by clicking on the **TABLE** tab

   NOTE: Each variable (NDVI, SWI, Precipitation, etc…) will have its own default value range and number of "bins". Like the example above, NDVI histograms will have 100 bins with values ranging from 0-1.



11. The Histogram tool also contains additional custom options. To view them, click on the **Configure** tab to return to the Histogram tool options.

12. Toggle on the switch labeled **Options.** A menu of available histogram chart options will appear below.

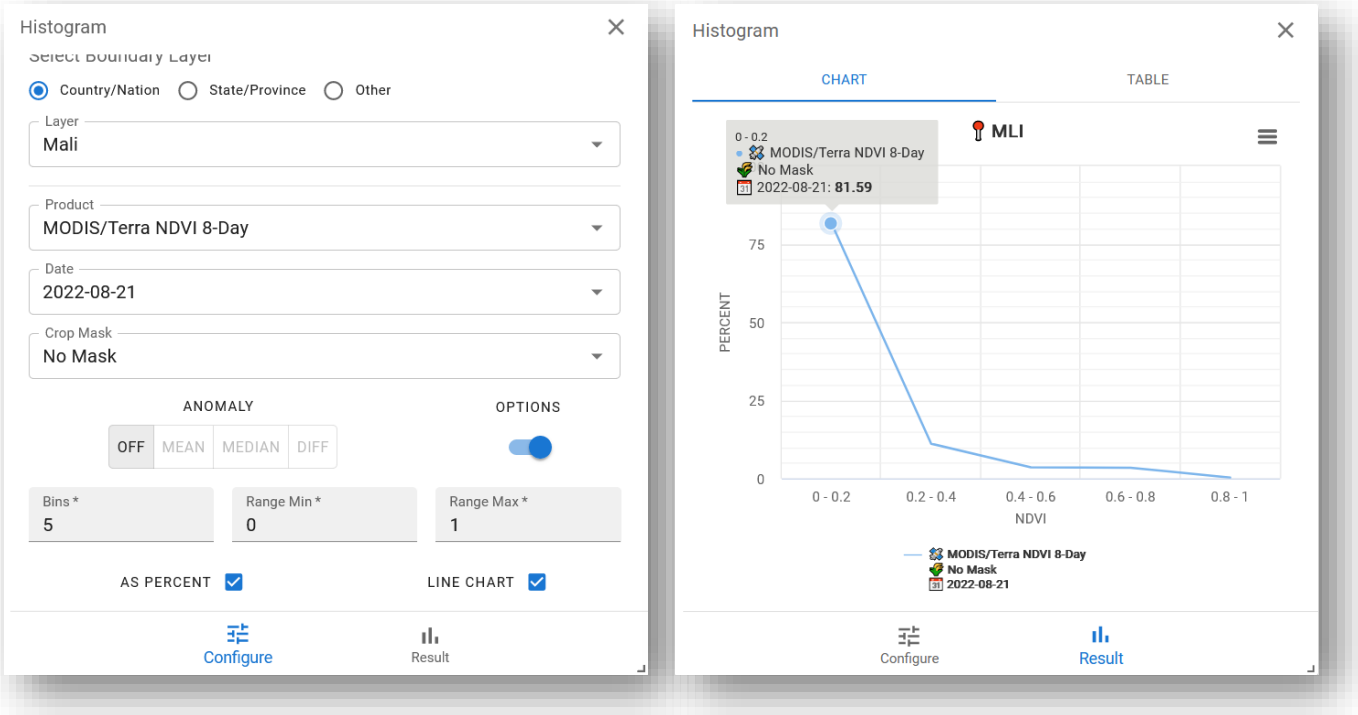
13. The first set of custom histogram options are text boxes, where a user can modify the number of bins that imagery values are sorted into and the range of values to include in the histogram.

14. By checking the option labeled **AS PERCENT**, values in the histogram will represent the percent of the image rather than number of pixels.

15. And the final option labeled **LINE CHART** changes the histogram from a bar chart to a line chart.

    The following example shows a chart modified with these custom options

    By reducing the number of bins, and viewing histogram values as a percent of the total area, we now easily see that over 80% of values covering this area for this particular date fall between 0 – 0.2 NDVI.



Graphic Tool

The last Dashboard tool covered in this guide is the Graphic tool. Use the Graphic tool to generate a simple image graphic displaying an imagery dataset for a particular area of interest. These graphics can be easily inserted into reports or presentations.

1. To add the Graphic Tool to the Dashboard, click the button with an icon depicting a bar graph.

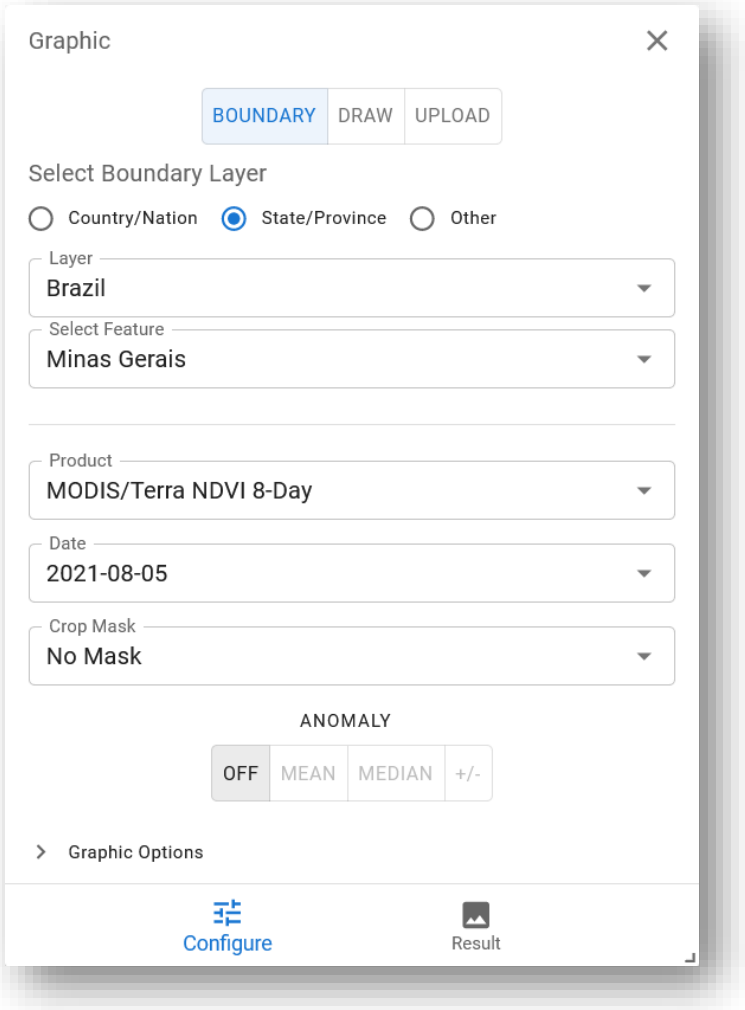
2. Select your area of analysis using one of the three methods previously outlined in this guide.

3. Select the imagery product you would like to use.

4. Select the imagery date.

5. Select from a list of available crop masks if you would only like to view data present in crop areas identified in a particular mask.

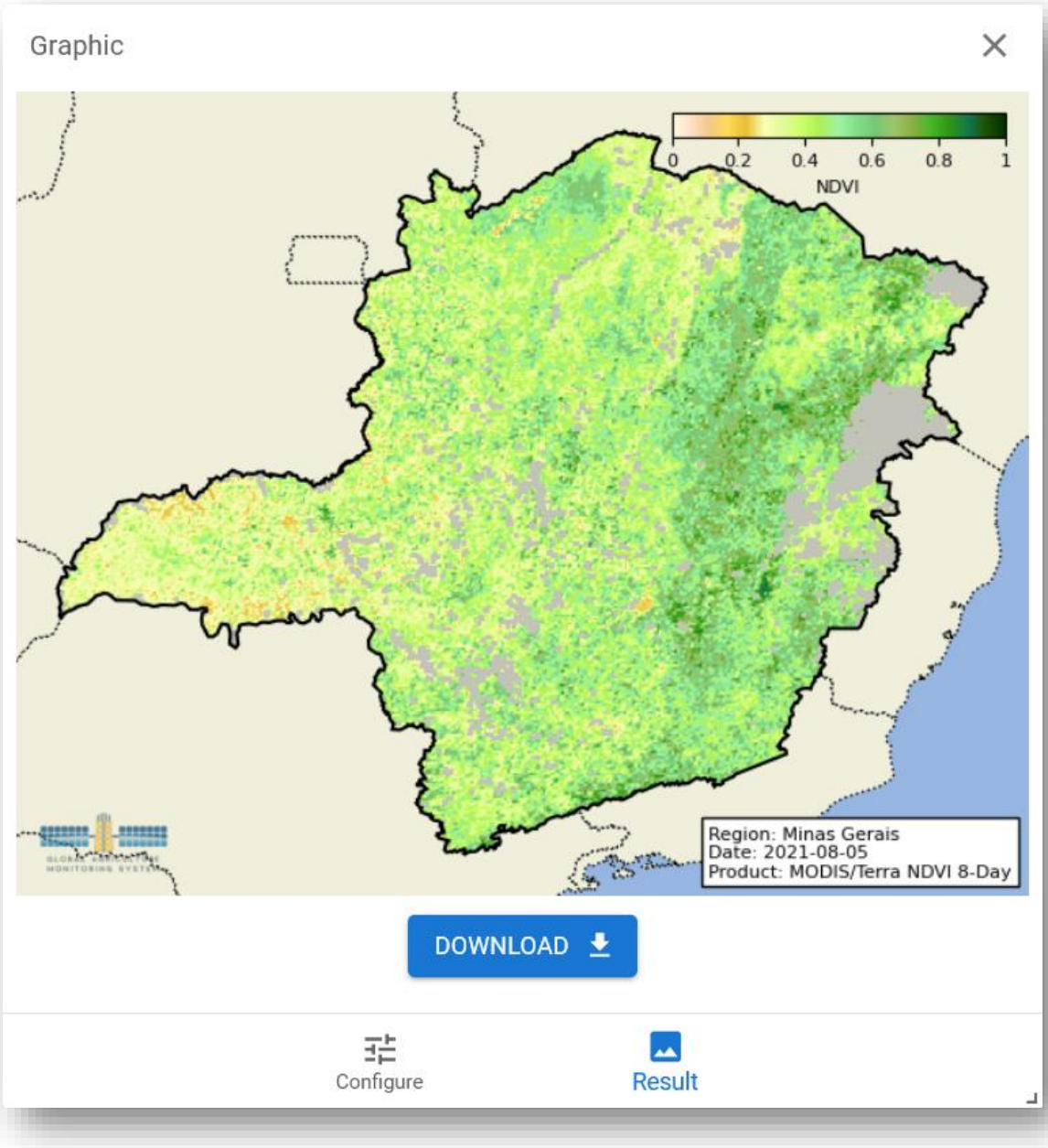
6. Optionally you may also use the Anomaly options to view the difference in imagery values for the selected date and the mean or median values over a period of time. These Anomaly options are similar to those in the **Explore** page for imagery visualization.



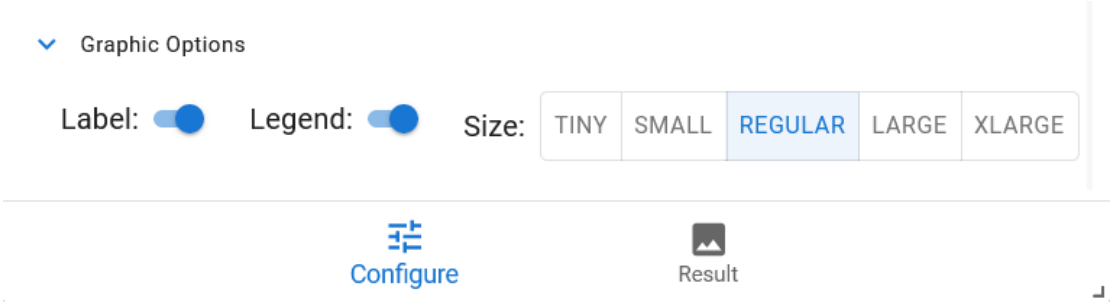
7. Once satisfied with the options selected for Product, Date, Mask, and Anomaly, click on the **Result Tab** identified by the same Graphic Tool icon at the bottom right of the tool window.

8. When finished loading, the resulting graphic will be displayed in the tool window. The graphic will show the imagery clipped to the geographic extent of the area of analysis.

   By default these graphics will also display a colorbar/legend to interpret image values and a label showing the name of the area of analysis, the date of the imagery, and which product the imagery belongs to.



9. The size of the graphic and whether to show the legend & label can be altered using the **Graphic Options** menu found at the bottom of the Graohic Tool options in the configure tab



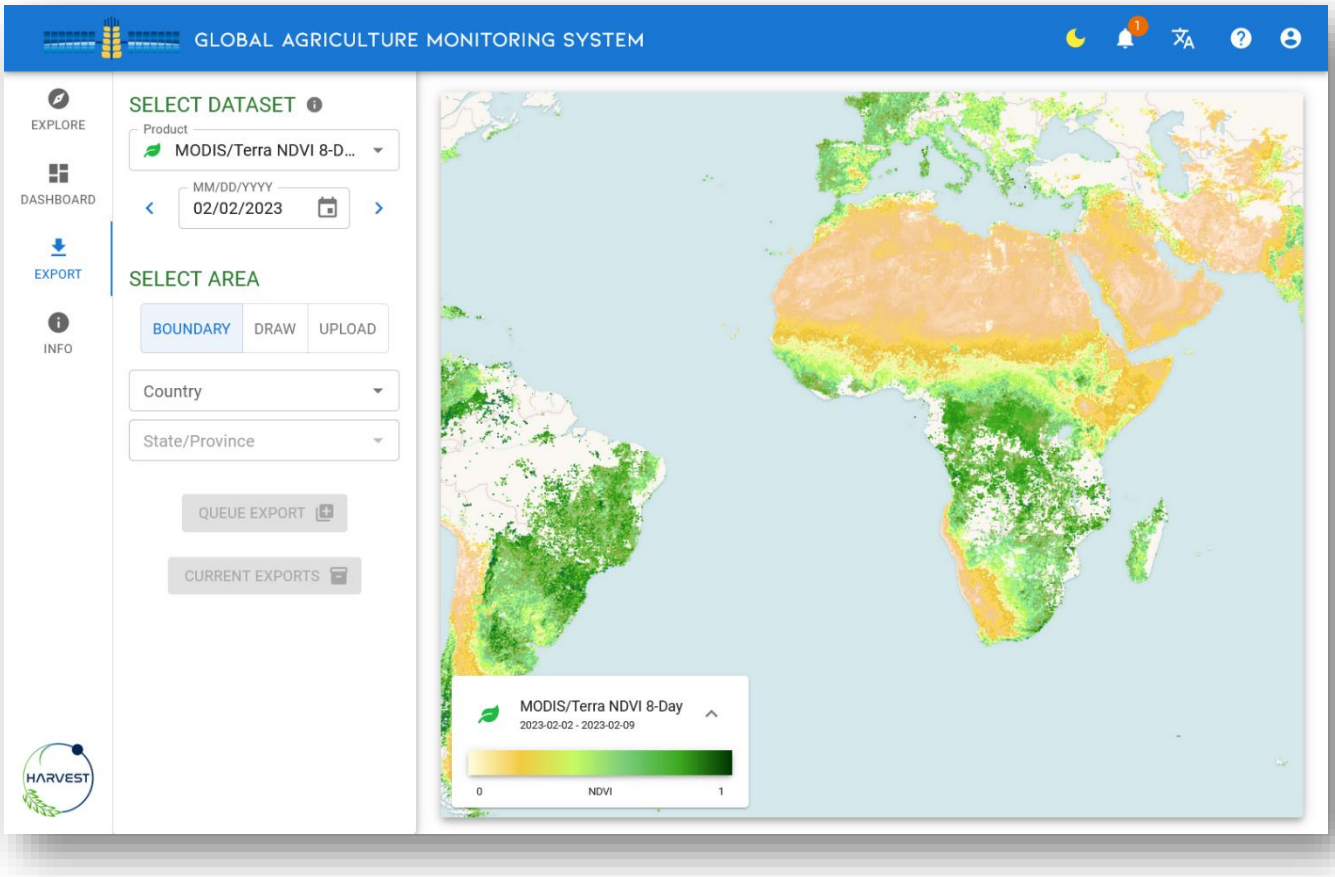
Part 3: Export

The Export Page allows users to export & download imagery for their own personal use.

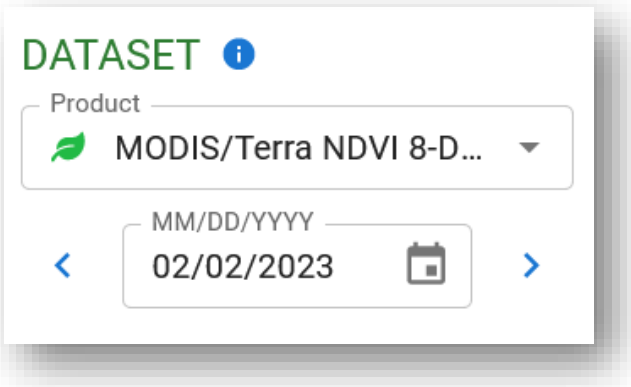
(To open the **Export** Page, click **Export** on the left side panel.)

Export Overview

The Export Page is very similar to the **Explore** Page. It contains a panel on the left-hand side with user options and a web map to its right that displays imagery to export.



Selecting a Dataset

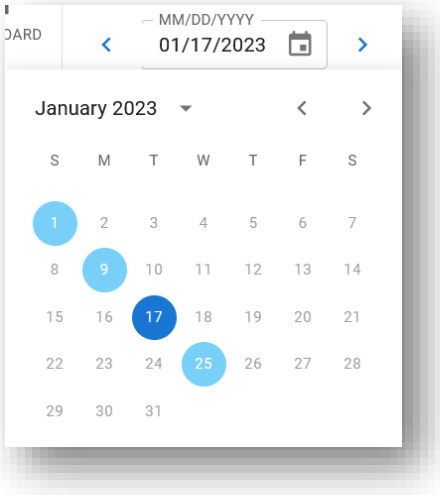


1. To select an imagery dataset for visualization, first select your desired product. The latest MODIS/Terra 8-Day NDVI dataset will be selected by default.

   To change the product, click the arrow next to the product listed to see a drop-down list of available products. Icons next to each product name will indicate the type of product. For example, the leaf icon will indicate an NDVI product while a rain cloud icon will indicate precipitation.

   Click on your desired product from the drop-down list to select it.

   After changing the product, the calendar below will automatically be populated with dates for which imagery is available.



2. Next, select the desired date for the imagery product that you would like to visualize. When a product is changed, the date will automatically change to the closest date available to the previously selected date.

   To change the date of the imagery that you would like to visualize, select a date from the calendar, or use the arrows on either side to automatically select the previous or next available imagery date.

   Expand the calendar by clicking on the calendar icon. Dates for which imagery is available will be shaded in light blue while the selected date will be a darker shade.

Note: For composite images (imagery data collected over many days) dates in the calendar represent the start of the composite period. The full composite period for the date selected will be displayed in the map legend.

With the calendar open, you may simply click an available date to select it, navigate to another month using the arrow buttons, or use the dropdown to select a different year

After a date is selected, the image on the map with automatically change to the new imagery.

Selecting an Area for Analysis

Currently, imagery can only be exported for a user provided geographic area. In future updates global imagery datasets may be available for download.

The methods to select this geographic area are nearly identical to those found in the **Dashboard** tools. As a reminder, these methods include:

1. Selecting from a list of administrative boundaries.
2. Drawing your own area on a map.
3. Uploading a GeoJSON of the area.

For each tool added to the Dashboard, there will be a row of buttons at the top, allowing a user to change which method they prefer.



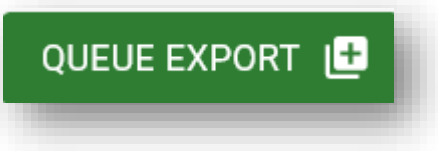
Please refer to Selecting an Area for Analysis for detailed instructions on how to use each method to select a geographic area.

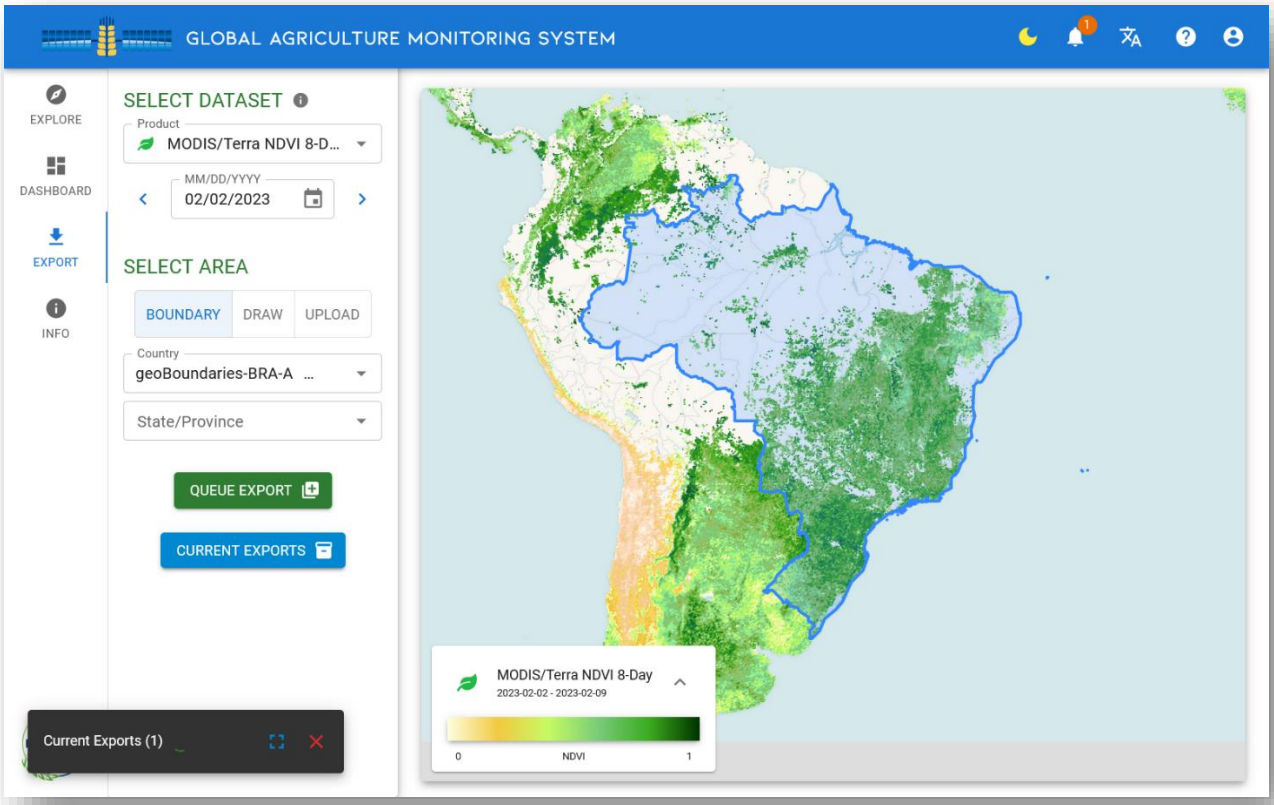
Once a geographic area is selected, the web map on the export page will pan/zoom to the selected area.

Adding an Export to the Queue

To handle multiple concurrent requests from a single user, and requests from multiple users of the Harvest GLAM system at the same time, there is a queue for imagery to be exported. When you have selected the Product, Date, and geographic area that you would like to export & download imagery for, you will add a request to this queue.

1. To add an export request to the queue, click the **QUEUE EXPORT** button.

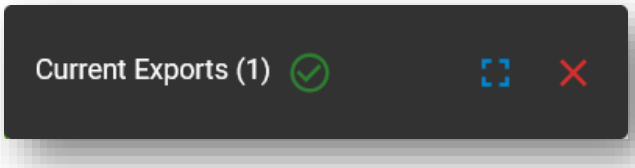




Export Status

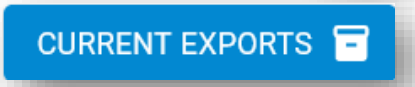
1. Once an export request is added to the queue, an indicator will appear in the bottom left corner of the screen, giving the user a quick look at the status of the export request, while also showing how many requests have been made during this session.

2. While an export is loading, this message will show a circular loading icon, when the export has been completed, this loading indicator will turn into a green checkmark icon.

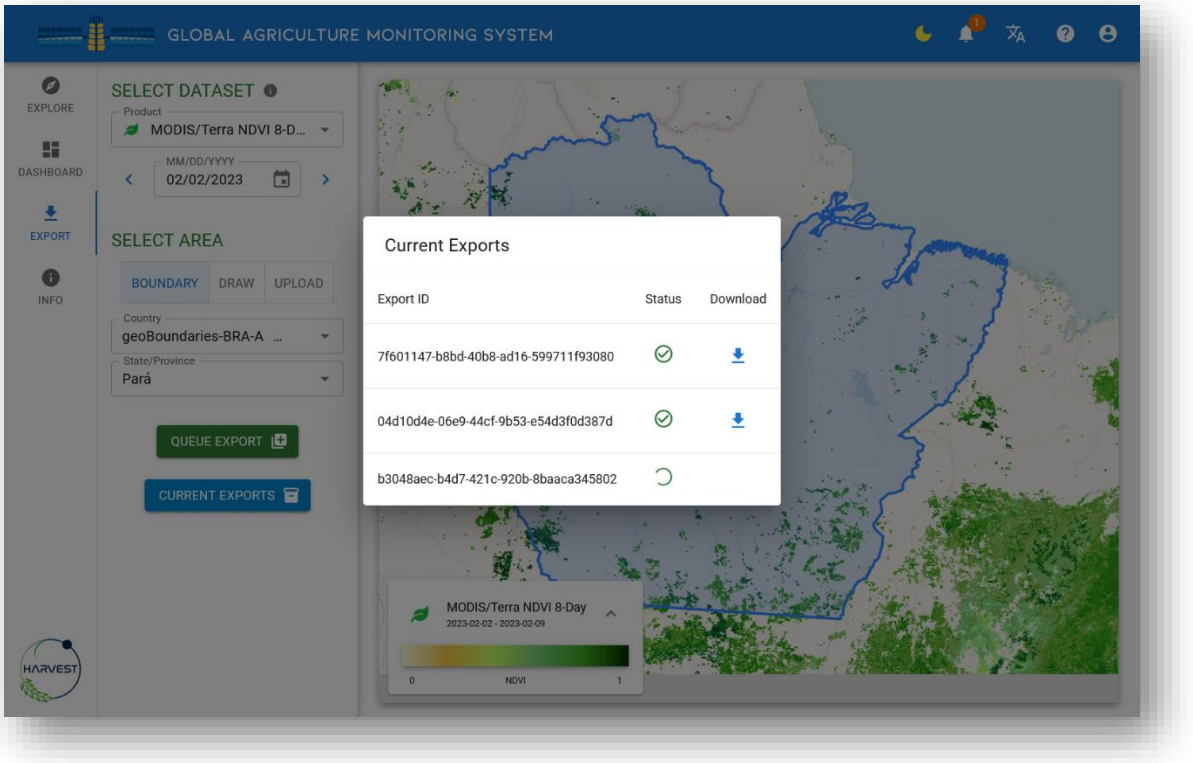


3. To view more details about the export request either click the expand button on the export indicator or click the button on the Export panel labeled **CURRENT EXPORTS.**





4. Clicking either of these buttons will open a new window, listing all export requests, their status, and if an export is complete, a button to click to download the imagery.



The above example shows the **CURRENT EXPORTS** window with multiple export requests. In this example, two of the three requests are complete with another pending.

Downloading

1. With the **CURRENT EXPORTS** window open, simply click the download button for a completed export and your browser will begin to download the exported imagery.



NOTE: Imagery exported from this tool are single band raster files in Cloud Optimized Geotiff (COG) format. For more information about this imagery format, please visit cogeo.org. The exported imagery will also be in the native spatial resolution and geographic projection as the source it was accessed from. Please visit the **Info Page** for more information about each imagery product's source.