WEBAFSA

Web Agroecology Fourier-based Similarity Assessment

https://webafsa.cdecentre.org/

SOFTWARE USER GUIDE

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I. Introduction

WEBAFSA (WEB Agroecology Fourier-based Similarity Assessment) is a sophisticated web-based tool designed for agroecological similarity assessments. It uses an innovative computational method based on Fourier transforms to compare different geographical areas based on their agricultural and ecological characteristics. The platform enables researchers, policymakers, and agricultural practitioners to assess land suitability for various agricultural purposes, such as crop growth, by comparing specific geographic locations with reference sites based on environmental and climatic factors. This guide will help you navigate and use WEBAFSA effectively, even if you don't have a strong background in mathematics or computer science.

II. Key Functionalities

WEBAFSA allows users to perform the following actions:

- **Select Reference Sites**: Choose a location of interest based on geographic coordinates (latitude and longitude). This site will serve as the baseline for comparing agroecological similarity with other regions around the world.
- **Input Variables**: Include climate data such as temperature, precipitation, soil pH, and topography. You can customize the analysis by adjusting the importance of each variable, ensuring that the factors most relevant to your assessment are emphasized.
- **Generate Similarity Maps**: Obtain maps that show agroecological similarity between a reference site and other regions. These maps visually represent areas that are environmentally similar, helping users make informed decisions about agricultural practices or land suitability.

III. Getting Started

A. System requirements

Before accessing WEBAFSA, ensure you have:

- A computer or mobile device with a stable internet connection
- An up-to-date web browser (Google Chrome, Mozilla Firefox, Microsoft Edge, or Apple Safari are recommended)

B. Accessing WEBAFSA

a. Open your preferred web browser.
b. In the address bar, type or copy-paste the following URL: https://webafsa.cdecentre.org
c. Press Enter or Return on your keyboard to load the WEBAFSA platform.

C. Navigating the homepage

Once the WEBAFSA website loads, you'll see the homepage with a split-screen interface:

- Left side: Input parameters and controls for similarity assessment
- Right side: An interactive map for selecting reference sites and viewing results

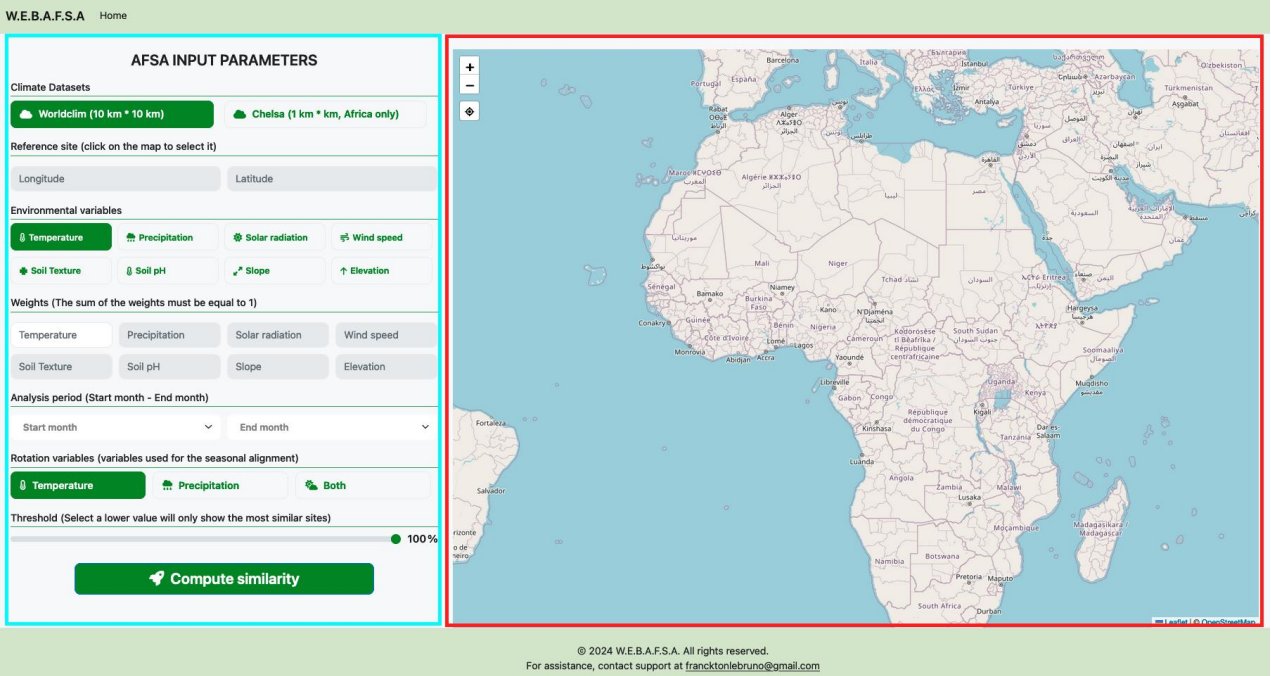


Figure 1: Landing page of WEBAFSA

IV. Step-by-Step Guide to Using WEBAFSA

Step 1: Specify the input parameters

On the left side of the screen, you'll find several input parameters. Let's go through each of them:

A. Climate datasets

Choose between two options for climate data:

- Worldclim (10 km * 10 km): A global climate dataset with a coarser resolution that covers the entire world. This option is ideal for broader, global-scale analyses.
- Chelsa (1 km * 1 km, Africa only): A higher-resolution climate dataset focused on Africa, providing more detailed data for this region.

Note: Computation using the CHELSA dataset requires extensive processing and is available upon request. Please contact the platform administrators for assistance with CHELSA-based analyses.

B. Reference site

The reference site is the location you want to compare other areas to in your analysis. To set the reference site:

- Click on the map on the right side of the screen.
- The longitude and latitude of the selected point will automatically fill in the input boxes.

C. Environmental variables

Select which environmental factors to consider in your analysis. These variables will define the criteria for agroecological similarity:

- Temperature: measures the average temperature of the area.
- Precipitation: refers to the amount of rainfall in the selected region.
- Solar radiation: indicates the intensity of sunlight the area receives, which can impact crop growth.
- Wind speed: shows the average speed of wind, affecting factors such as pest suitability.
- Soil texture: currently disabled, but will allow analysis based on the type of soil particles in the region.
- Soil pH: currently disabled, but will help assess the acidity or alkalinity of the soil.
- Slope: currently disabled, but will indicate the steepness of the terrain, important for assessing land usability.
- Elevation: currently disabled, but will eventually reflect the altitude of the region, which affects temperature and climate.

To include a variable in the analysis, simply click on the box containing the variable's name.

D. Weights

Assign importance to each selected environmental variable to prioritize factors in your analysis. The sum of all weights must equal 1. For example:

- Temperature: 0.5
- Precipitation: 0.5

This would give equal importance to temperature and precipitation, allowing you to focus on these factors while ignoring others. Adjust the weights based on which factors you deem most important for your analysis.

E. Analysis period

Choose the start and end months for your analysis. This is useful for focusing on specific growing seasons or time periods of interest:

- For example, if you are studying crop suitability during a particular planting season, you can select the relevant months for more accurate insights.
- Select a timeframe that corresponds with seasonal variations that may impact your analysis.

F. Rotation variables

Select which environmental variables to use for aligning seasonal patterns. This helps adjust for shifts in seasons and ensures accurate comparisons:

- Temperature: aligns patterns based on temperature variations.
- Precipitation: aligns patterns based on rainfall distribution.

- Both: adjusts for both temperature and precipitation to capture a more holistic seasonal pattern.

Choosing the right rotation variable(s) can enhance the accuracy of your analysis by accounting for temporal shifts.

G. Threshold

Use the slider to set a similarity threshold. This threshold filters the results, showing only locations that meet a minimum similarity level to your reference site:

- A lower threshold will display only the locations most similar to your reference site.
- A higher threshold will include more areas, even those with moderate similarity, for broader comparisons.

Adjusting the threshold allows you to refine the output based on how strict or broad you want your similarity comparison to be.

Figure 2: WEBAFSA input parameters interface

Step 2: Generating the similarity map

Once you've set all your parameters:

- Click the **"Compute Similarity"** button at the bottom of the left panel.

- A progress indicator will appear. Please wait; the calculation may take up to 3 minutes depending on your inputs.
- When the computation is complete, the map on the right will update to display the similarity results.

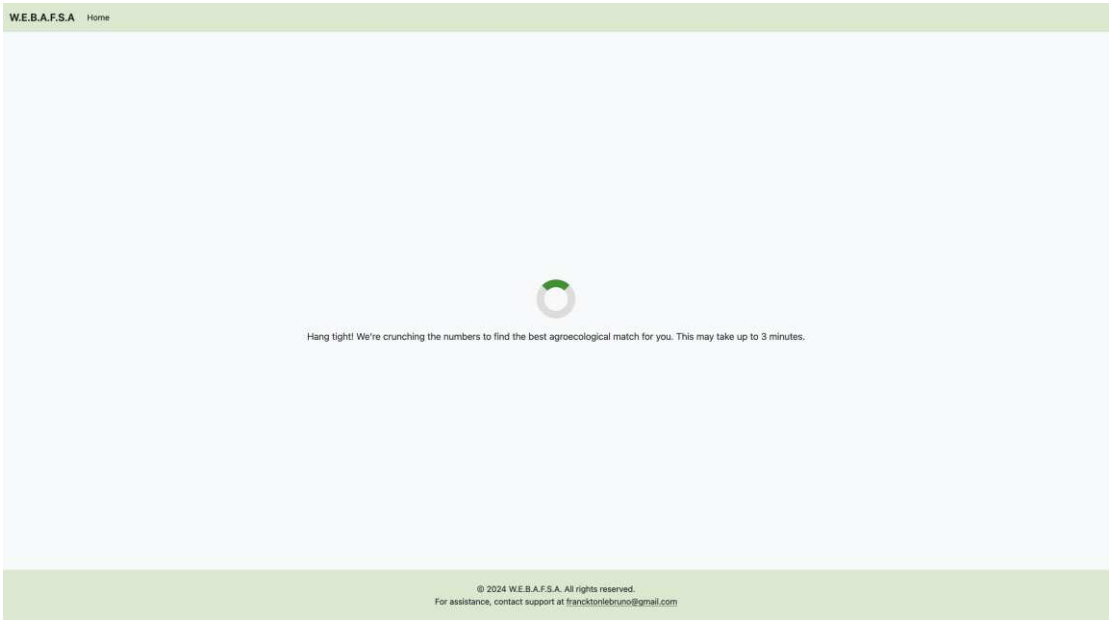


Figure 3: WEBAFSA loading screen. This interface displays while the platform processes the user's input to find the best agroecological match.

Step 3: Interpreting the Results

The similarity map uses color gradients to indicate how closely other areas resemble your reference site:

- **Green:** Extremely similar
- **Light Green:** Highly similar
- **Yellow:** Moderately similar
- **Orange:** Fairly similar

Key Features for Navigating and Interpreting Results:

- **Interactive exploration:** Click on different areas of the map to view detailed similarity percentages for specific locations.
- **Zoom and pan tools:** Use these to navigate the map and focus on regions of interest. For the zoom, use the "+" and "-" buttons on the map, or your mouse scroll wheel. Regarding the navigation, click and drag the map to move around.
- **Geolocate your position:** Use the geolocation button below the zoom panel to center the map on your current location for quick reference.
- **Layer switching:** Toggle between the OpenStreetMap layer and the AFSA layer to easily locate specific places and retrieve their similarity percentages.

- **Data export for external analysis:** Upon request, you can have access to the AFSA layer for further analysis or reporting in external software such as QGIS and ArcGIS.
- **Map legend:** Refer to the legend to understand the color gradients and their corresponding similarity levels.

By analyzing these results, you can identify potential areas for agricultural expansion, research, or targeted interventions. Consider cross-referencing the map data with local knowledge or other resources to enhance your decision-making process.

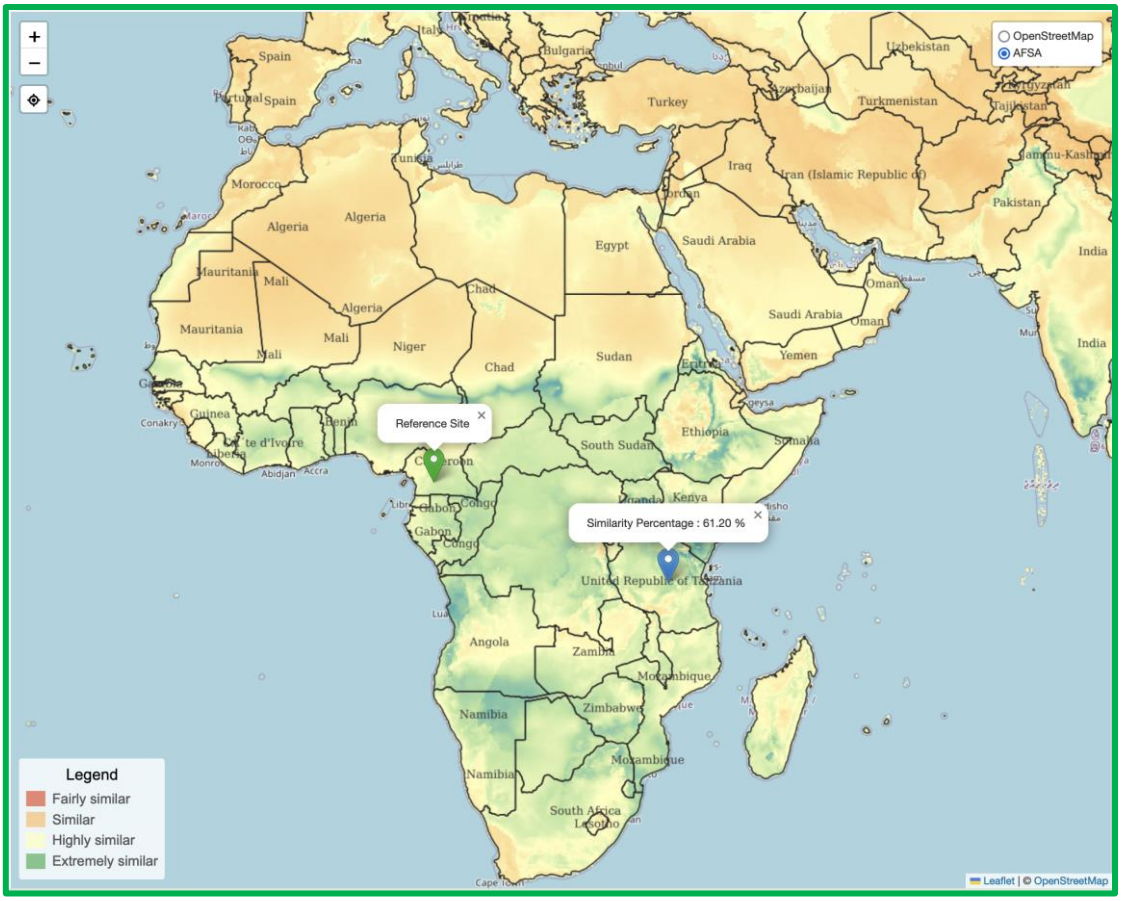


Figure 4: WEBAFSA similarity map interface showing agroecological similarity across Africa. The reference site is marked with a green pin in Cameroon, and a selected location in Tanzania shows a 61.20% similarity.

V. Frequently Asked Questions (FAQ)

Q1. What type of data does WEBAFSA use?

Answer: WEBAFSA utilizes high-resolution climate data (more specifically TIFF raster files) from sources like CHELSA (Climatologies at High resolution for the Earth's Land Surface Areas), soil data from ISRIC (International Soil Reference and Information Centre), and topographic data from SRTM (Shuttle Radar Topography Mission). The platform processes these variables using Fourier transform methods to assess agroecological similarities.

Q2. Can I use WEBAFSA for any pest and crop?

Answer: Yes. By inputting the relevant variables that affect your pest or crop's suitability, WEBAFSA generates results based on those agroecological factors.

Q3. Is the platform free to use?

Answer: Yes, WEBAFSA is free and accessible at https://webafsa.cdecentre.org/.

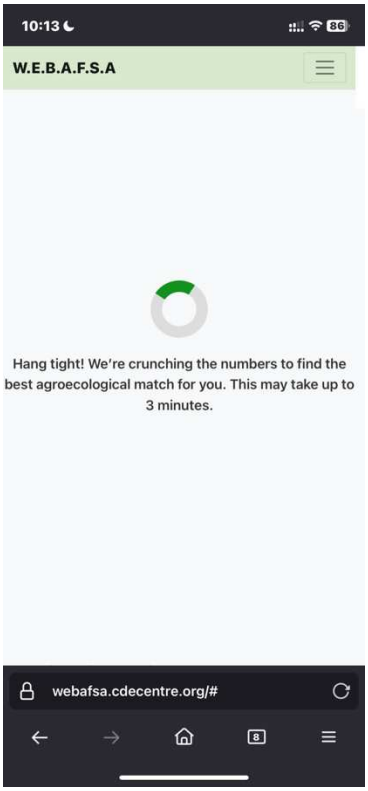
Q4. I can't generate a map. What should I do?

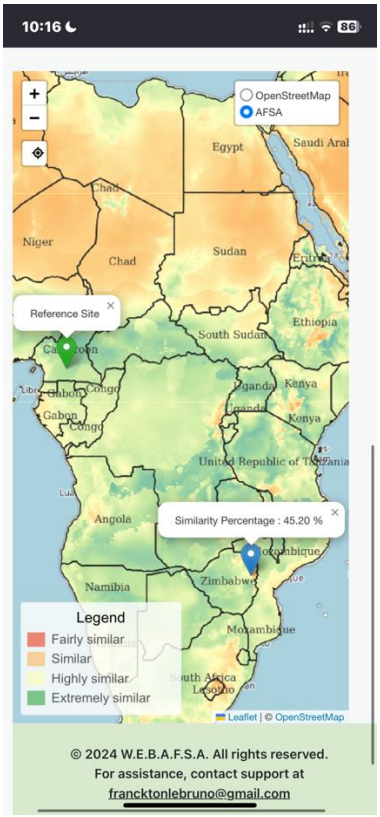
Answer:

- Check Inputs: Ensure all required fields are filled out correctly.
- Variable Selection: At least one variable must be selected.
- Contact Support: If the issue persists, reach out via the contact information provided.

Q5. Is WEBAFSA mobile-friendly?

Answer: Yes, the platform is optimized for mobile devices. For the best experience, use a tablet or larger smartphone screen.





Q6. How often is the data updated?

Answer: Climate data is updated annually, while soil and topographic data are updated periodically as new information becomes available.

Q7. Can I customize the variables beyond what's listed?

Answer: Currently, the platform supports predefined variables. Future updates will include options for custom variable inputs.

VI. Glossary

- **Agroecological similarity**: The degree to which two areas share similar agricultural and ecological characteristics.
- **Fourier transform**: A mathematical method to transform signals between time (or spatial) domain and frequency domain.
- **Reference site**: The location you're comparing all other areas to.
- **Environmental variables**: Factors like temperature, rainfall, and soil type that affect an agroecosystem.
- **Weights**: The importance given to each environmental variable in the analysis.
- **Analysis period**: The specific months of the year you're focusing on for your comparison.
- **Rotation variables**: Environmental factors used to align seasonal patterns between different locations.
- **Threshold**: A cut-off value for similarity; lower thresholds show only the most similar areas.

VII. Contact Information

Here are the contact details for the technical support team, ensuring that you have access to assistance when you need it:

1. Email

For technical assistance, contact us at francktonlebruno@gmail.com.

2. Phone

Reach us at +254 743 412 639 for prompt and reliable support.

VIII. Conclusion

WEBAFSA is a powerful and user-friendly tool designed to assist in making data-driven agricultural decisions. By following this comprehensive guide, users from all backgrounds can effectively utilize the platform to perform agroecological similarity assessments.