Description of the Crop Diversity and Resilience Dataset

The crop diversity and resilience dataset simulate a scenario where agricultural practices are implemented to assess the diversity and resilience of crops within an agricultural system. This dataset comprises features related to crop diversity metrics, specific crop types, crop rotation practices, intercropping patterns, pest resistance measures, soil characteristics, weather conditions, soil health, crop yield, and an overall crop resilience index. The goal is to explore the intricate relationship between agricultural practices, environmental factors, and the resilience of the agricultural system.

## **Features**

1. Crop\_Diversity\_Metrics: Quantifies the level of crop diversity within the agricultural system, ranging from 1 to 5.
2. Crop\_Diversity: Specifies the type of crops cultivated, including options such as Rice, Wheat, Maize, and Millet.
3. Crop\_Rotation\_Practice: Indicates whether crop rotation is implemented (Yes/No).
4. Intercropping\_Patterns: Describes the level of intercropping patterns within the agricultural system, categorized as Low, Medium, or High.
5. Pest\_Resistance\_Measures: Specifies whether pest resistance measures are employed (Yes/No).
6. Soil\_Type: Classifies the soil composition within the agricultural area, with choices including Sandy, Loamy, and Clayey.
7. Temperature\_Celsius: Represents the temperature in degrees Celsius.
8. Precipitation\_mm: Represents the amount of precipitation in millimeters.
9. Humidity\_Percentage: Reflects the humidity percentage in the air.
10. Wind\_Speed\_kph: Represents the wind speed in kilometers per hour.
11. Soil\_Health\_Index: An index representing the health and fertility of the soil.
12. Crop\_Yield\_Tons\_per\_Hectare (target 1): Represents the crop yield in tons per hectare.
13. Crop\_Resilience\_Index (target 2): An index quantifying the overall resilience of the crops within the agricultural system.

## **Possible research questions**

The question listed below aims to delve into the intricate dynamics between agricultural practices, environmental factors, and the overall resilience of crops within a diverse and sustainable agricultural system. Machine learning models can provide valuable insights into optimizing crop management strategies for enhanced resilience and productivity.

1. Impact of crop diversity metrics on crop resilience: How does the quantified level of crop diversity metrics correlate with the overall resilience of crops, and can diverse crop practices enhance resilience?
2. Crop-specific resilience patterns: Are there specific crop types that exhibit higher resilience in certain environmental conditions, and can this information inform crop selection strategies?
3. Effect of crop rotation on soil health: Does the implementation of crop rotation practices influence soil health, and how does it impact overall crop resilience?
4. Intercropping and crop resilience: What is the relationship between the level of intercropping patterns and the resilience of crops, and can certain intercropping practices enhance overall resilience?
5. Pest resistance measures and crop yield: How do pest resistance measures influence crop yield, and can these measures contribute to increased resilience against pest-related challenges?
6. Weather conditions and soil health: How do weather conditions, including temperature, precipitation, and humidity, influence soil health, and subsequently impact crop resilience?
7. Correlation between soil health and crop resilience: Is there a correlation between the soil health index and the overall resilience of crops, and can soil health be considered a key factor in enhancing crop resilience?
8. Optimal crop practices for high yields: Can machine learning models identify optimal combinations of crop rotation, intercropping, and pest resistance measures for maximizing crop yield and resilience?
9. Environmental factors and crop-specific resilience: How do environmental factors such as temperature, precipitation, and wind speed influence the resilience of specific crop types, and can predictive models capture these relationships?
10. Trade-offs between crop diversity and yield: Are there trade-offs between crop diversity and crop yield, and can models recommend practices that balance diversity with high yields and resilience?