Description of the Agroecology Impact Dataset

The Agroecology Impact Dataset simulates a scenario where agroecological practices are implemented, integrating agricultural cultivation with ecological principles. This dataset encompasses features related to tree cover, biodiversity metrics, carbon sequestration, crop types, soil characteristics, soil moisture content, and crop yield. The goal is to evaluate the impact of agroecological practices on ecological health, carbon sequestration, and agricultural productivity.

## **Features**

1. Tree\_Cover: Represents the extent of tree cover on the agroecological site, categorized as Low, Medium, or High.
2. Biodiversity\_Metrics: Quantifies the level of biodiversity present in the agroecosystem, ranging from 1 to 5.
3. Carbon\_Sequestration: Measures the amount of carbon sequestered in the soil, with values ranging from 1 to 10.
4. Crop\_Type: Specifies the type of crops cultivated within the agroecosystem, including options such as Rice, Wheat, and Maize.
5. Soil\_Type: Classifies the soil composition on the agroecological site, with choices including Sandy, Loamy, and Clayey.
6. Soil\_Moisture\_Content: Reflects the moisture content in the soil, ranging from 0.1 to 1.
7. Crop\_Yield\_Tons\_per\_Hectare: Represents the crop yield in tons per hectare, with values ranging from 1 to 10.

## **Possible Research Questions**

These research questions aim to explore the complex interplay between ecological factors and agricultural outcomes within an agroecological context. Machine learning models can provide insights into optimizing agroecological practices for sustainable and resilient agroecosystems.

1. Effect of tree cover on biodiversity: How does varying levels of tree cover influence the biodiversity metrics within the agroecosystem, and can machine learning models predict optimal tree cover for enhanced biodiversity?
2. Correlation between biodiversity and carbon sequestration: Is there a correlation between biodiversity metrics and carbon sequestration in the soil, and can models identify agroecological practices that promote both?
3. Crop-specific soil preferences: Do different crop types exhibit preferences for specific soil types, and can models recommend optimal soil-crop combinations for sustainable agriculture?
4. Impact of soil moisture on crop yield: How does soil moisture content affect crop yield, and can models predict optimal moisture levels for maximizing crop productivity?
5. Tree cover and carbon sequestration: What is the relationship between tree cover and carbon sequestration in the soil, and how can this information guide agroecological practices for climate mitigation?
6. Optimizing agroecosystem for multiple objectives: Can machine learning models optimize the agroecosystem for multiple objectives, considering factors such as tree cover, biodiversity, and carbon sequestration?
7. Crop yield prediction based on ecological factors: Can models accurately predict crop yields based on a combination of ecological factors, including tree cover, soil type, and moisture content?
8. Trade-offs between biodiversity and crop yield: How do trade-offs between biodiversity and crop yield manifest in the agroecosystem, and can models recommend practices that balance ecological health and agricultural productivity?