

# **Does Kenya's membership in UPOV impact its crop yields compared to non-UPOV member East African countries?**

## **Introduction:**

Our research embarks on a journey guided by the intersection of agriculture, policy, and economics to understand the impact of Kenya's membership in UPOV (International Union for the Protection of New Varieties of Plants) on its crop yields. As a dedicated agricultural entity committed to sustainability, we aim to uncover insights that inform our operations and contribute to broader discussions on agricultural policies. Central to our investigation is how Kenya's UPOV affiliation affects crop yields compared to neighboring East African countries. Utilizing empirical analysis grounded in the Food and Agriculture Organization (FAO) of the United Nations data, we seek to address this question and address concerns about the efficacy of UPOV in enhancing crop productivity.

## **Purpose:**

Researchers and other experts suspect that the growth of the UPOV has not resulted in larger crop yields over time and would like to test their hypothesis by analyzing publicly available data from the FAO. The aim is to use the SARIMA model to predict crop yields and compare East African countries that are members of the UPOV to those that have yet to join by focusing on specific agricultural products related to currency, like Soybeans, Coffee, and food oils.

## **Methodology: Model Selection, Evaluation, and Performance**

A SARIMAX model was selected due to its handling of seasonality. SARIMAX models are suited for time series data accompanied by seasonal patterns. This model's limitations include a limited forecast horizon. Root Mean Square Error (RMSE), Mean Absolute Error (MAE), and Akaike and Bayesian Information Criteria were used to assess the model's performance. These values provide context for how well the model fits the data and its predictability.

## **Analysis:**

By meticulously examining datasets spanning from 1961 to 2021, encompassing hectares of land harvested and tons of output produced for various primary crops across more than 200 nations, supplemented by comprehensive information on membership in UPOV, we aim to contribute substantially to this discourse. Our aim is not merely to scrutinize but to provide actionable insights that empower stakeholders to make informed decisions and drive positive change within the agricultural landscape. The SARIMA model seeks to predict agricultural yields with seasonality in time series and does approximate an accurate prediction.

## **Recommendations:**

The political conflicts of the East African region were noted in the data. For example, the civil war between Eritrea and Ethiopia produced a division from a single source into two independent sources of data, often missing data for years from the ongoing conflict. Likewise, the continuing civil war in Sudan

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caused a division in the data between Sudan and Southern Sudan. The residual impact of British colonial rule on the government structure and community connection left disjointed results for UPOV member Kenya.

Reporting for each country gave the appearance of stationarity, disrupted the periodicity of the data, and required special treatment. Awareness of the geopolitics of each area and comparison of nations based on humanitarian status is an essential aspect of domain knowledge for this data.

### **Implementation:**

While some of the missing values could be sourced from the World Bank, this widely accepted data source also lacks data from conflict years. As a group, our analysis focused more on the regional influence of UPOV membership. An aggregate of the data from the newly divided nations was used to represent the regional agrarian potential. For successful implementation as a predictive analytic, the SARIMA model would need to focus on specific commodities and require consistent, longitudinal data for accurate predictions.

### **References:**

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