KilimoRiziki Decision Hub

PRESENTED BY: GROUP 2

Introduction

Kenya has witnessed significant advancements in agricultural technology (agri-tech) aimed at enhancing various aspects of the agricultural sector. Its vibrant agricultural sector, is the bedrock of our nation's prosperity. But navigating its complexities, from ever-shifting demographics to unpredictable weather patterns, demands informed choices. Recognizing this critical need, **KilimoRiziki** DecisionHub emerges as a beacon of empowerment for Kenyan farmers and or investors.

KilimoRiziki envisions a future where agriculture thrives on data-driven insights as it stands as a comprehensive tool, meticulously crafted to equip farmers and investors in the agricultural sector with the knowledge and resources they need to make confident choices every step of the way.

Business Understanding

Problem Statement

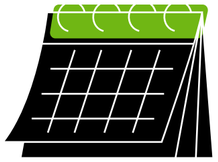
In Kenya, agriculture is the backbone of our economy yet, making informed decisions in this dynamic sector requires navigating a plethora of factors – from population dynamics to climate conditions. Kenyan farmers lack the data and tools needed to make informed decisions to optimize crop selection, resource allocation, and market timing, resulting in poor yields and missed market opportunities.

Solution

Our solution delves into historical data from 2018 to 2022, exploring population trends by county, agricultural inputs such as Fertilizers, Crop chemicals, Fuel and power, Bags, Manufactured feeds, Certified Seeds, Machinery and labor, retail crop prices with our primary focus being; Maize, Beans, Millet, Sorghum, Potatoes, and Bananas, GDP contribution of growing of crops to the overall economy, and climate change patterns in average temperature and rainfall. With a Content-Based Filtering model, KilimoRiziki recommender System will leverage these features identified through predictive models, bivariate, and univariate analysis.

Objectives

YEARLY CHANGES PREDICTION



Predict changes in key indicators such as population growth rate, costs of agricultural inputs, retail prices of key crops, average rainfall, temperature variations, and GDP of agricultural practices.

ESTABLISHING RISK CRITERIA

we define risk criteria for each crop annually and per county based on identified features and historical data.

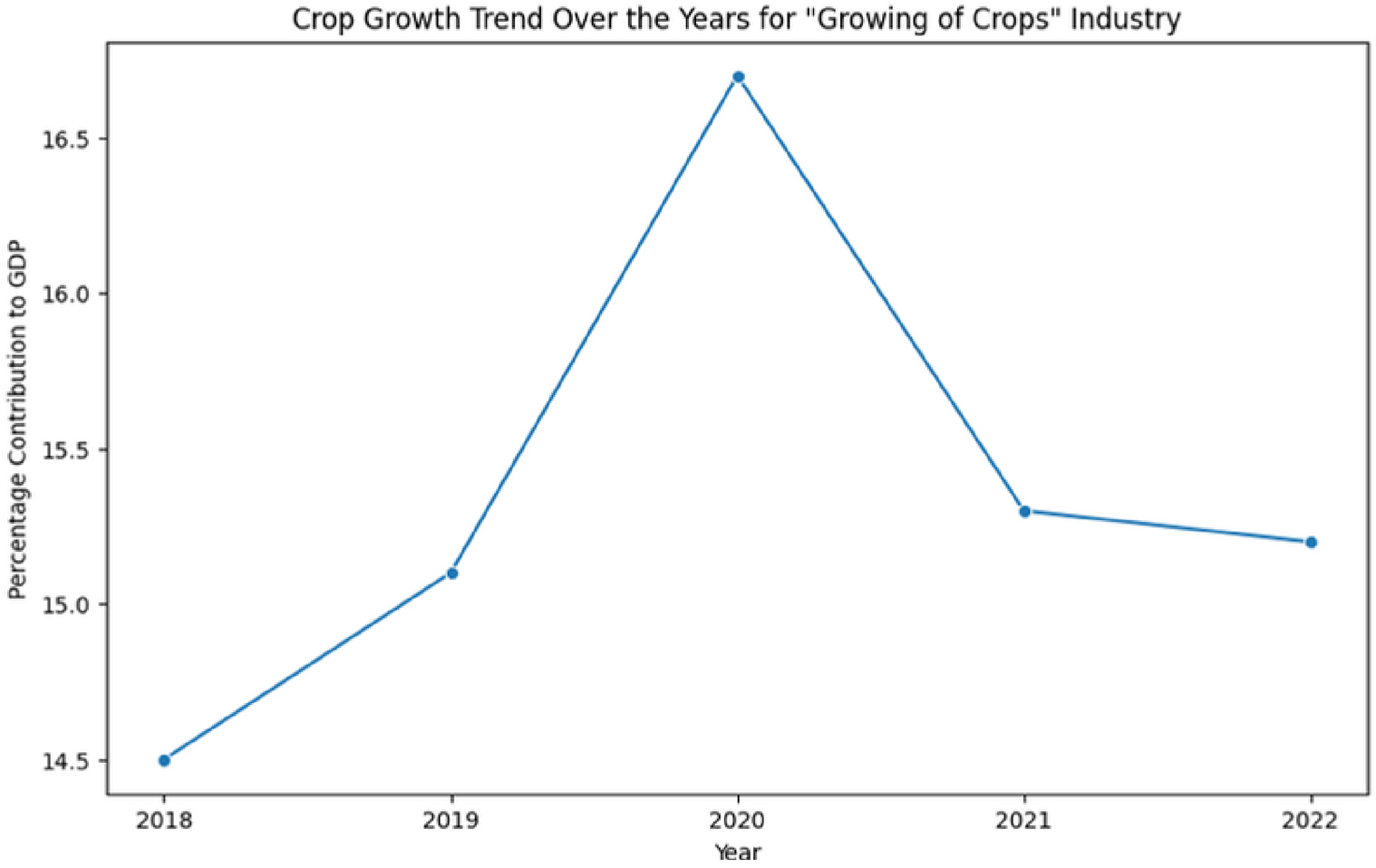
IMPLEMENT KILIMORIZIKI DECISION HUB

By implementing a canvas where data transforms into insights. Investors input their preferences, and the Hub doesn't just provide a list of crops; it paints a portrait of risk offering actionable insight into the current and future agricultural market.

Data Understanding

- The data used in our solution is sourced from Kenya National Bureau of statistcs (KNBS) and comprises of different tables of data for Agricultural inputs, climate data, population data, retail prices of the main crops in focus maize, beans, bananas and potatoes and Gross domestic price data.
- These data tables have information that span from 2012 to 2023.

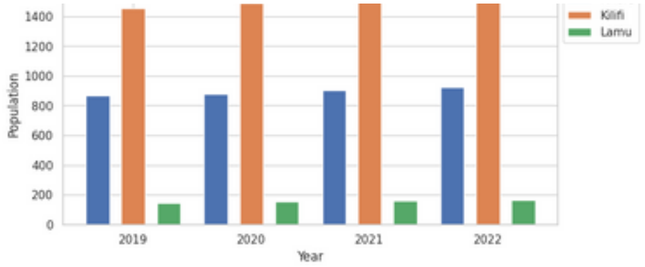
Visualizations

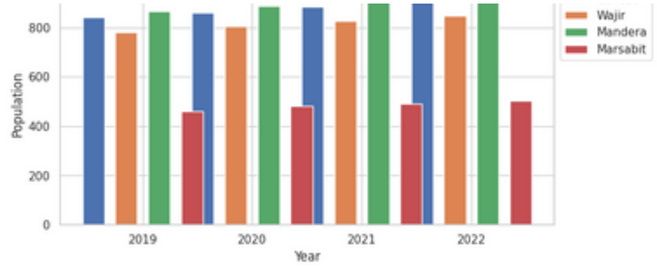


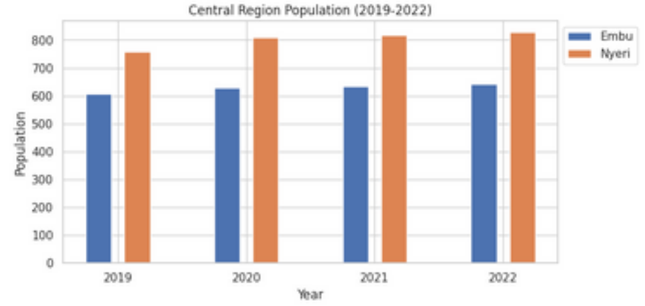
The line plot demonstrates the contribution of crops to the GDP of Kenya from 2018 to 2022

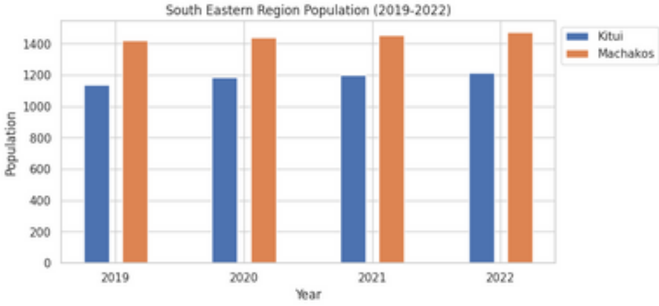
Visualizations

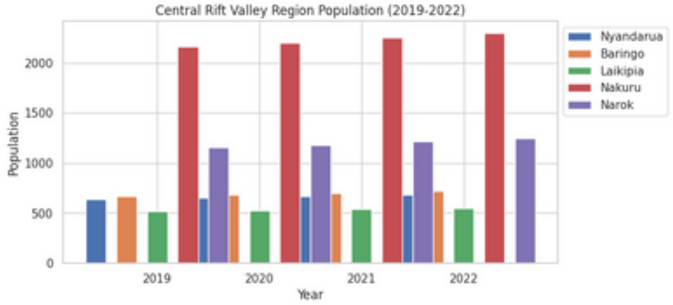
The bar grapghs show the population distribution per county in Kenya from 2019 to 2022

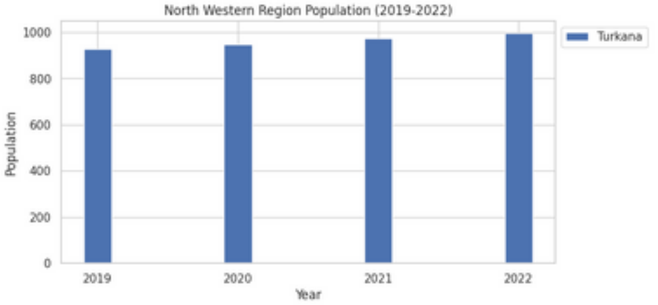


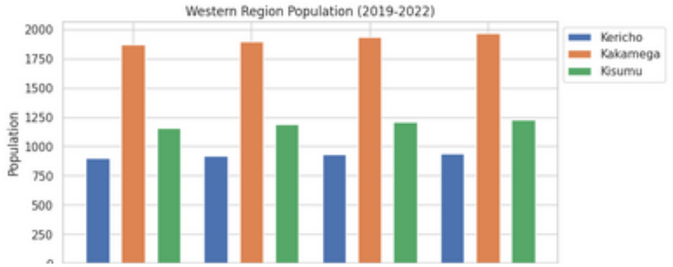






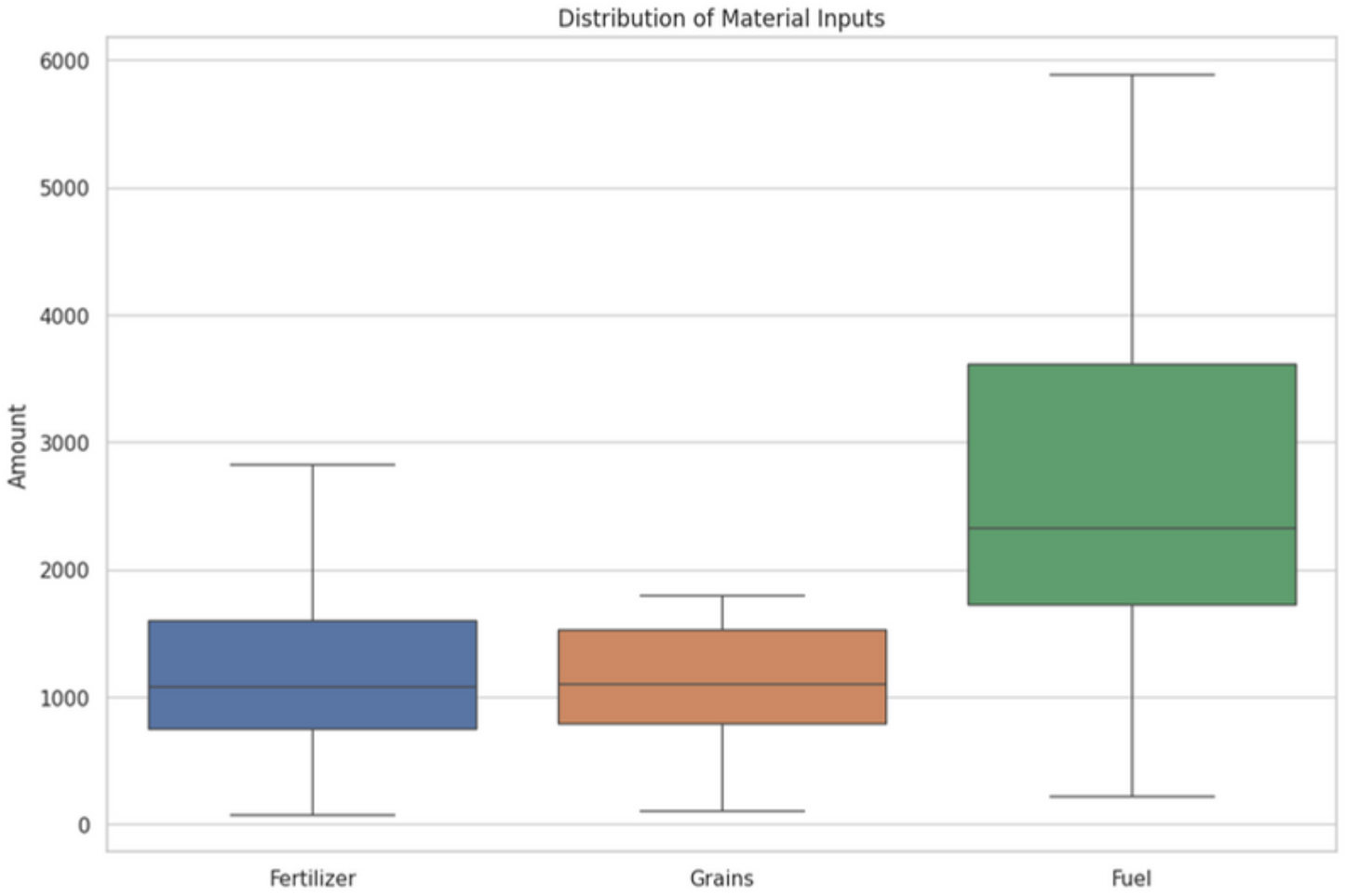




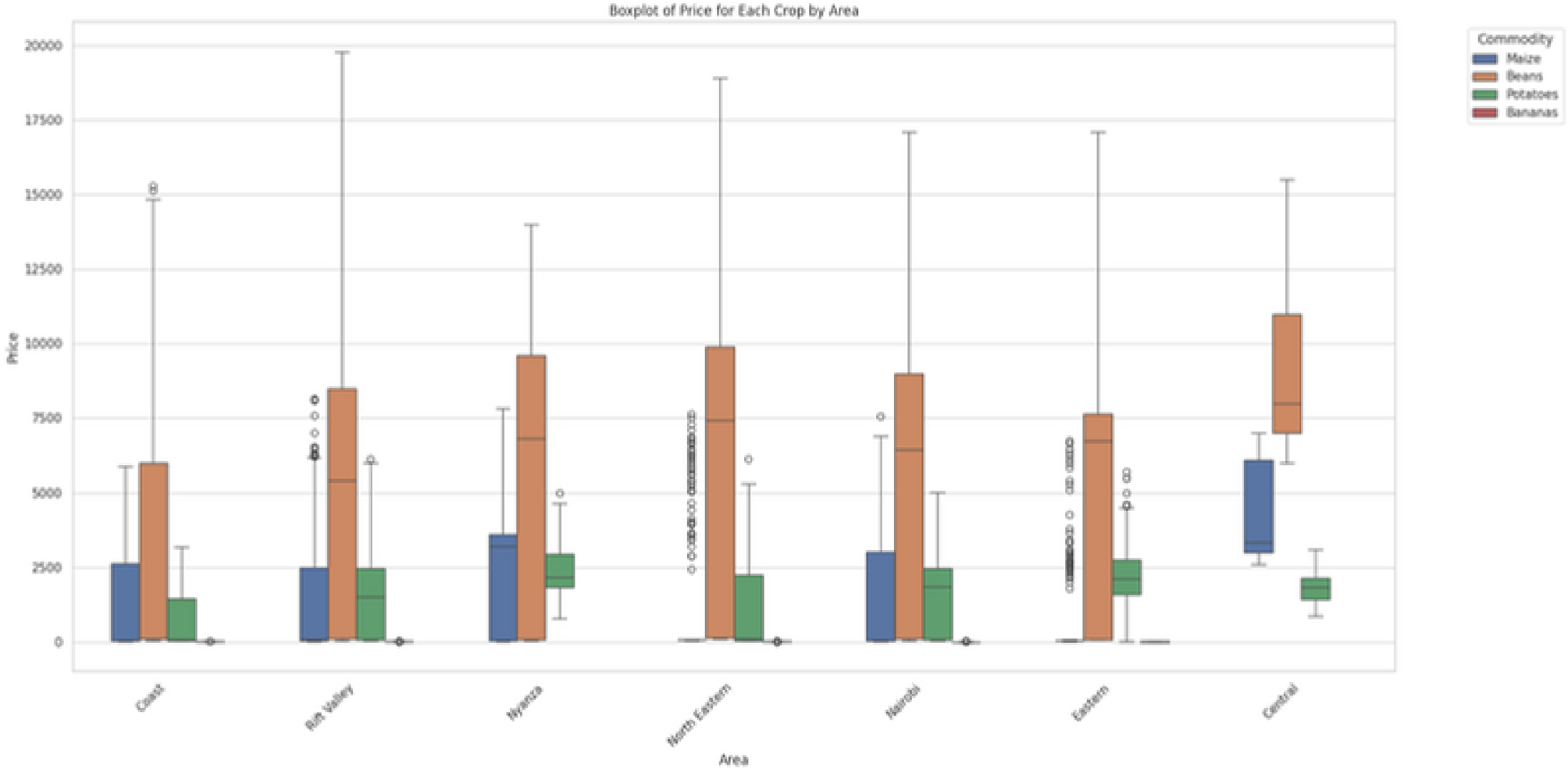


Visualizations

A boxplot showing the distribution of material inputs necessary for growing of crops

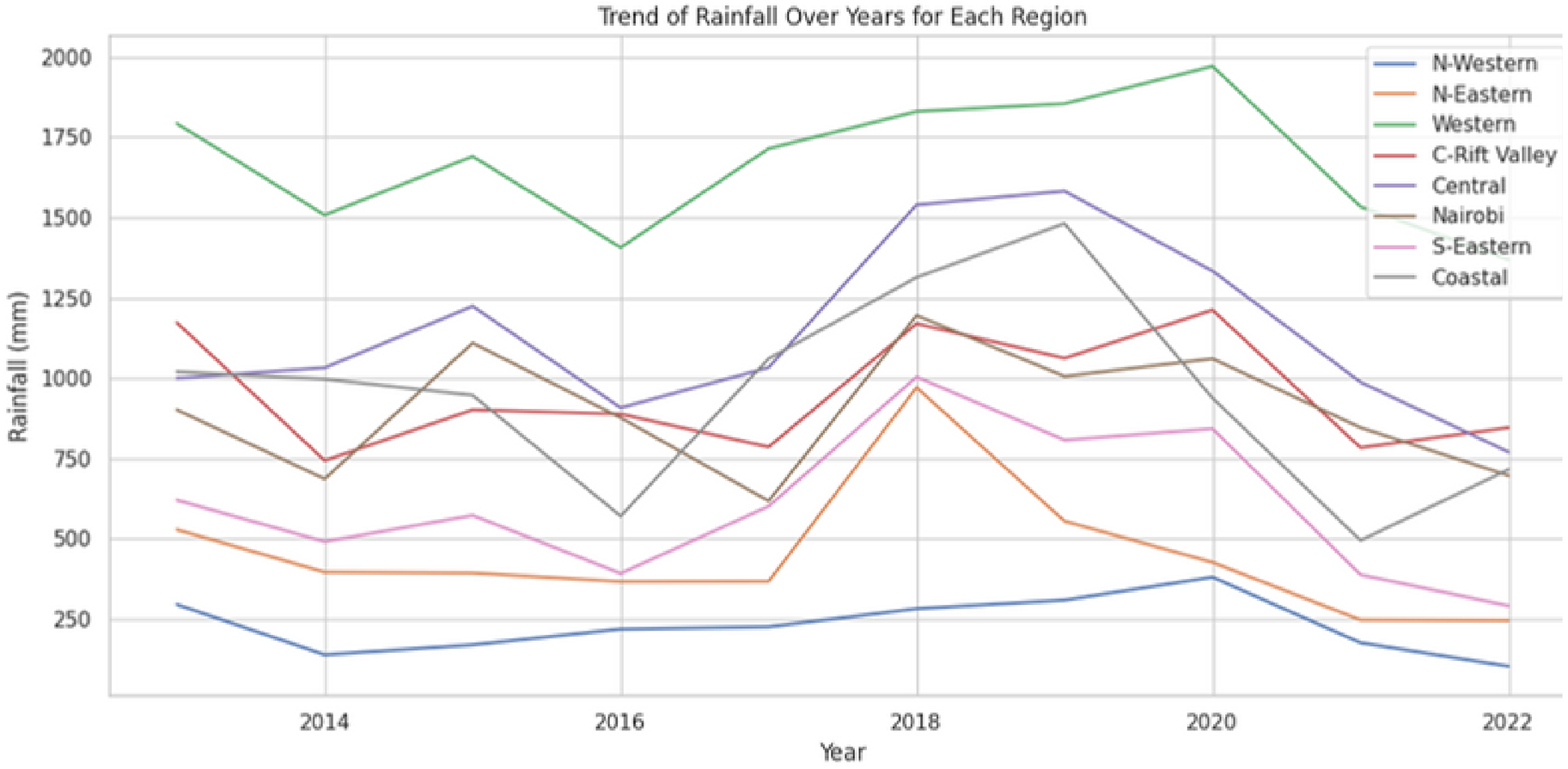


Visualizations



A boxplot indicating the crops grown in each county

Visualizations



A line plot showing the trend of rainfall over the years per region

Methods of Handling Data

Data collection

Cleaning,visualisation and pre-processing: Handling missing values, outliers, scaling, and normalization Feature engineering: Extracting relevant features like trends & seasonality

Model Training

Selecting a suitable model (e.g., ARIMA,SARIMA) based on data characteristics and task (forecasting, anomaly detection, trend analysis). Training the model on historical data while optimizing hyperparameters

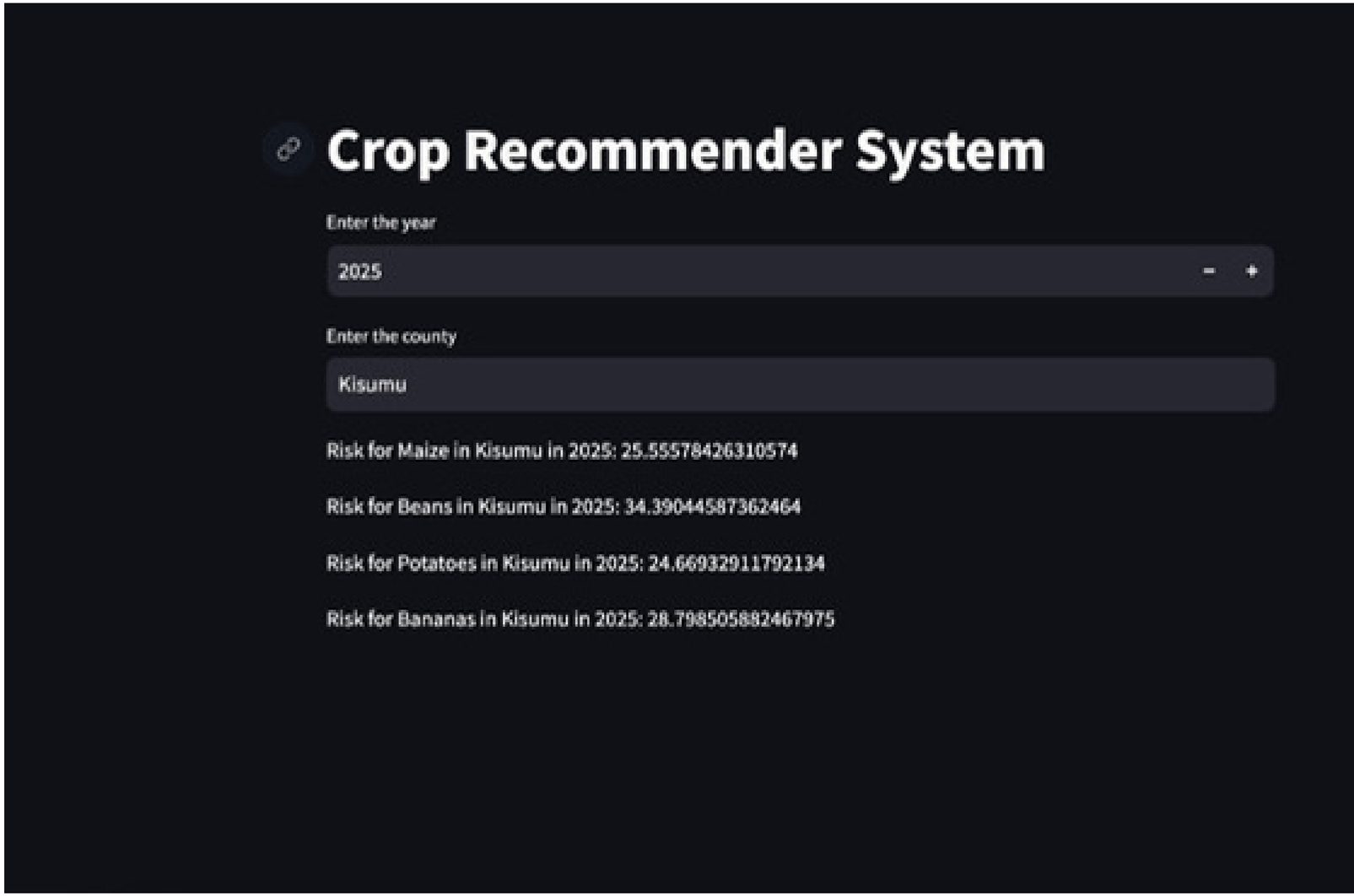
Evaluation & Deployment

Monitoring model performance metrics (e.g., MAPE, RMSE)

Deploying the model in production for real-time prediction or analysis.

Results

After successful predictions of Yearly changes from 2023 to 2028 across vital parameters like population growth, agricultural input costs, retail prices of key crops, climate variations, and the GDP of agricultural practices specifically Growing of Crops as well as establishing a risk criteria for each crop annually based on these features, KilimoRiziki Decision Hub was succesfully deployed , giving the user an option to choose the year and county .



Results

The final output is obtained by

- Calculating retail risk based on price percentages
- There is assessment of risk based on changes in fuel, fertilizer, and grain prices.
- Assignment of a fixed GDP risk value of 15.
- Assigning a high risk (70) if the crop is not suitable for cultivation in the county.
- Finally calculating a total risk score by averaging population risk, material input risk, retail risk, GDP risk, and suitability risk.

Challenges

The data gathered for analysis is historical data from 2012 to 2023 ,the major challenge has been data scarcity and quality where a number of crucial data is missing and or required us to pay a fee for access. This could prove limiting in terms of what the model can achieve.

Given the robustness of this model, time constraint limits the ability to experiment with different algorithms, features, and hyperparameters. This can prevent finding the optimal model for our objectives which may resulti in subpar performance.

Next steps

- Gather comprehensive and up-to-date data on population dynamics, agricultural inputs, crop prices, GDP, and climate conditions across various regions in Kenya.
- Conduct user testing and feedback sessions to evaluate the decidion hub platform's usability, functionality, and effectiveness in supporting decision-making processes for farmers and investors

THANK YOU!

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