

PREDICTING FOOD PRICES IN KENYA

SokoSmart Analysts



SOKOSMART MEMBERS



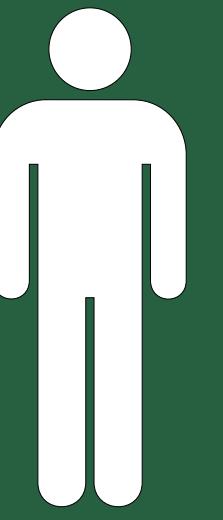
Cynthia
Nasimiyu



Julius
Charles



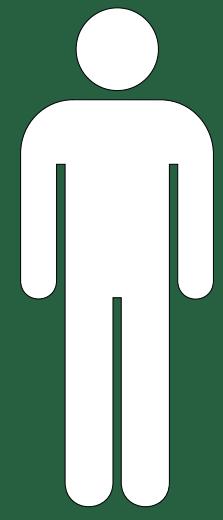
Wambui
Thuku



John
Karanja



Mariacharlotte
Mbiyu



Ismail
Ibrahim

Overview

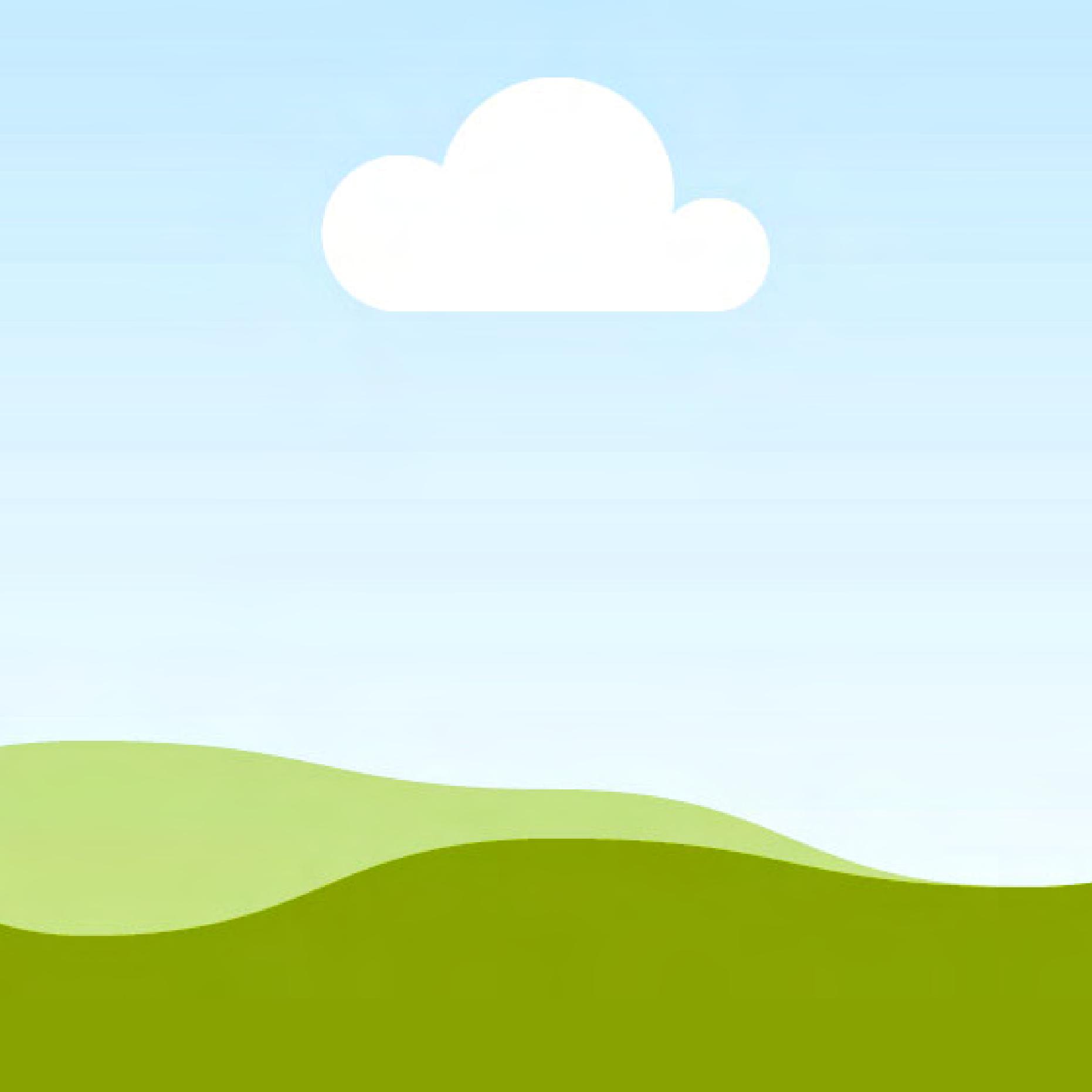
- This project is dedicated to addressing the critical issue of food security and pricing challenges within Kenya's agricultural sector.
- With over 80% of the Kenyan population relying on agriculture for their livelihoods, the project aims to provide comprehensive solutions to empower both farmers and retailers.
- By analyzing extensive datasets, including food prices, inflation rates, and weather patterns, the project seeks to uncover key trends and relationships, segment regions, conduct geospatial analyses, and investigate correlations.
- Additionally, it endeavors to develop predictive time series models for food price forecasting and offer actionable recommendations to stakeholders.

Problem statement

How can the application of advanced data science methodologies contribute to meeting the critical needs of Kenyan farmers and retailers by providing predictive insights into future commodity prices?



Objectives

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- **01** To identify key patterns and trends and relationships in the data
 - **02** Develop a predictive robust timeseries model that predicts the future prices of key agricultural commodities in Kenya
 - **03** Create a Market Basket Analysis for Retailers
 - **04** To deploy a crop pricing model.
 - **05** To provide recommendations on the outcomes of the project to our stakeholders

Stakeholders

Kenyan Farmers

Retailers specializing in Cash crops

The background of the slide is a high-angle aerial photograph of a rural landscape. It features a patchwork of agricultural fields in various stages of crop growth, from dark green to golden yellow. A network of narrow, light-colored dirt roads winds through the fields, some with small clusters of trees. The terrain is slightly hilly, creating a textured pattern of land use.

Data Understanding

Main dataset

Contains Food Prices data for Kenya, sourced from the World Food Programme Price Database.

Additional datasets

Other external datasets were merged into our main dataset for better prediction. This includes Inflation rates sourced from the Central Bank of Kenya and weather patterns data.

Data preparation



Merged the 3 datasets



Renamed columns to represent the data correctly



Unnecessary columns were dropped



Handling Missing values



EXPLORATORY DATA ANALYSIS (EDA)

UNIVARIATE
ANALYSIS

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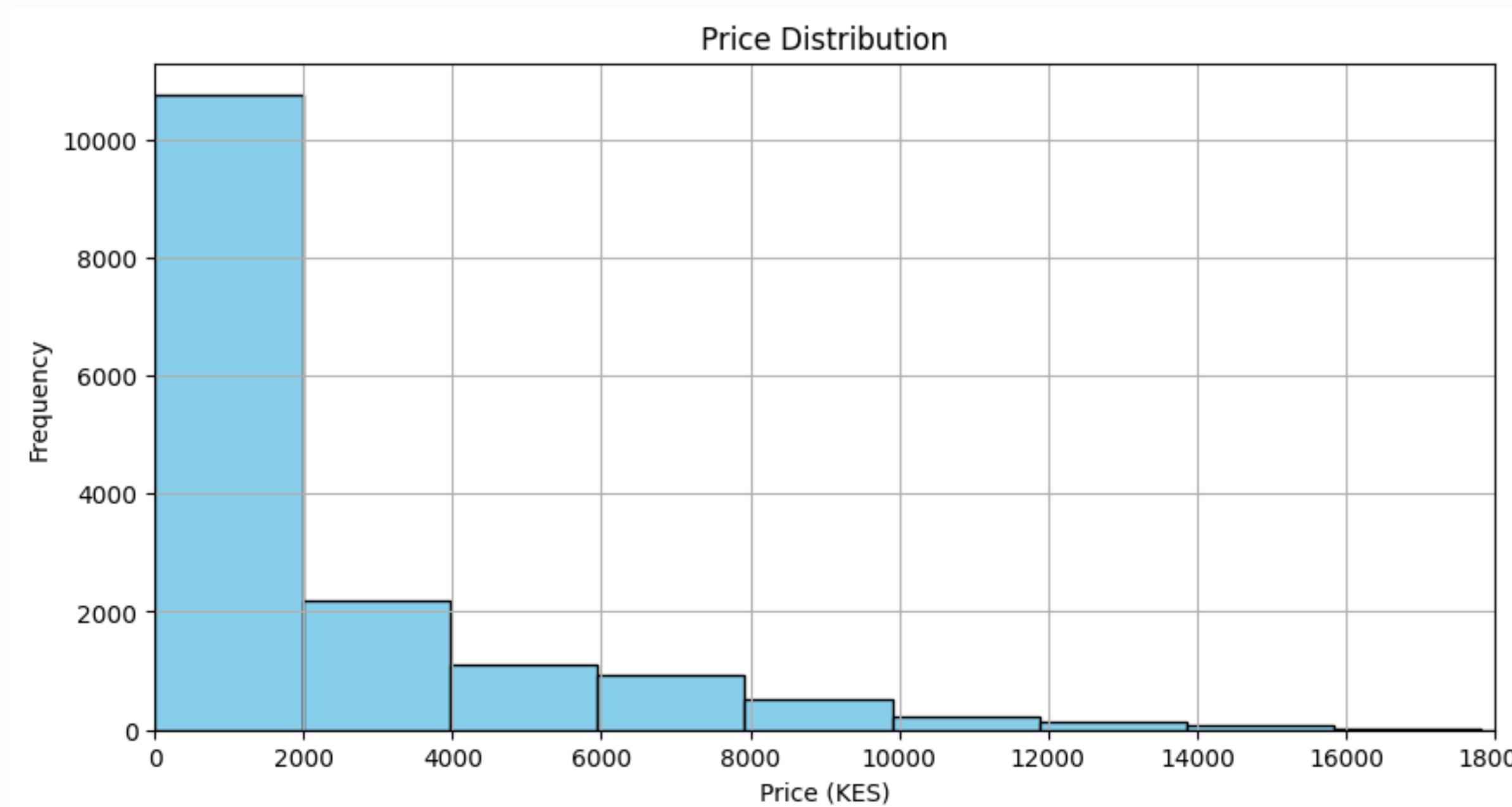
BIVARIATE
ANALYSIS

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MULTIVARIATE
ANALYSIS

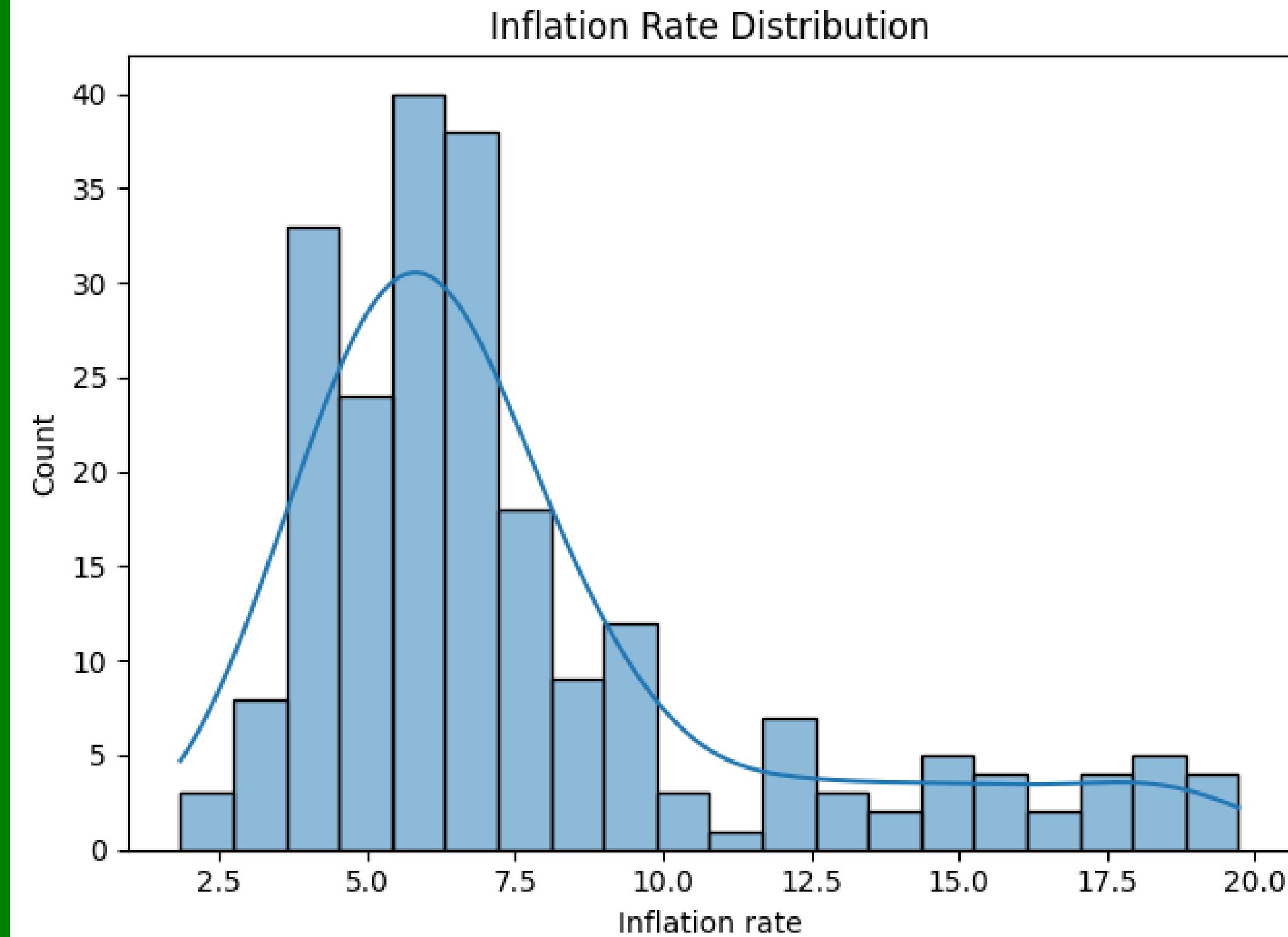


UNIVARIATE ANALYSIS



COMMODITY PRICES VARY FROM AS LOW AS 5 TO AS HIGH AS 19,800.

The inflation rate varies from a minimum of 1.85% to a maximum of 19.72%, with an average inflation rate of approximately 7.0%.

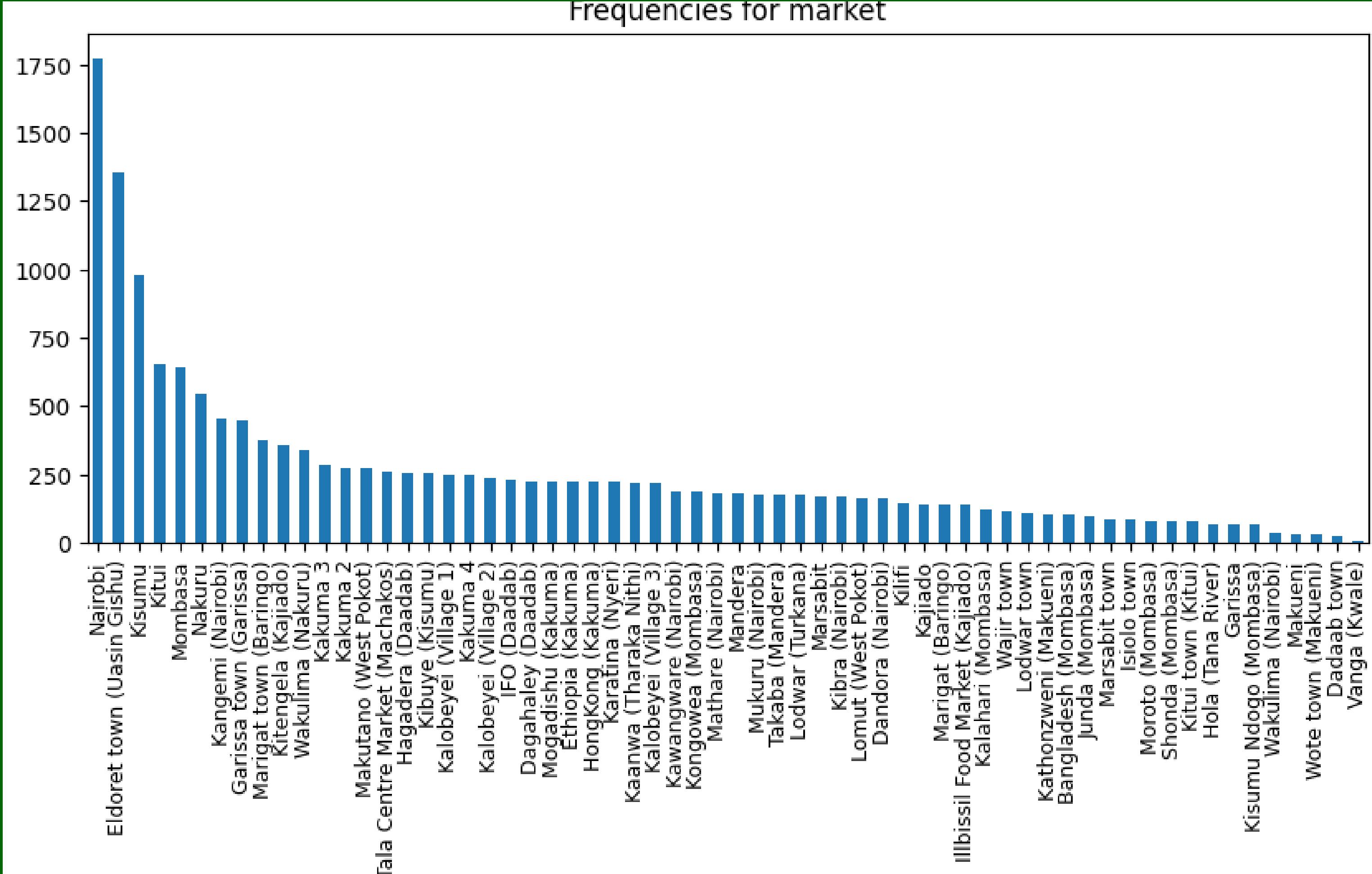




Market Analysis

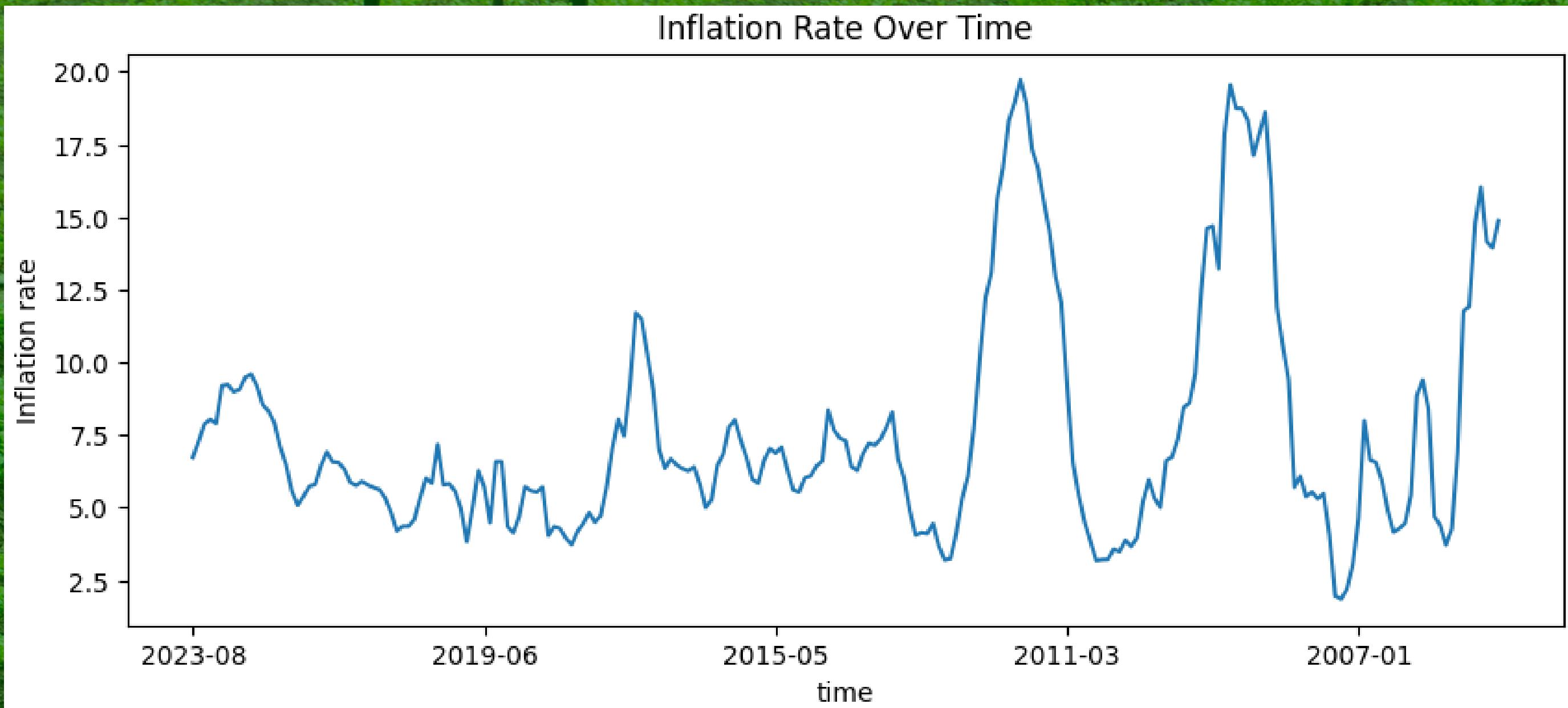
Frequencies for market

Most of the markets surveyed were located in Nairobi followed by Eldoret town and then Kisumu.



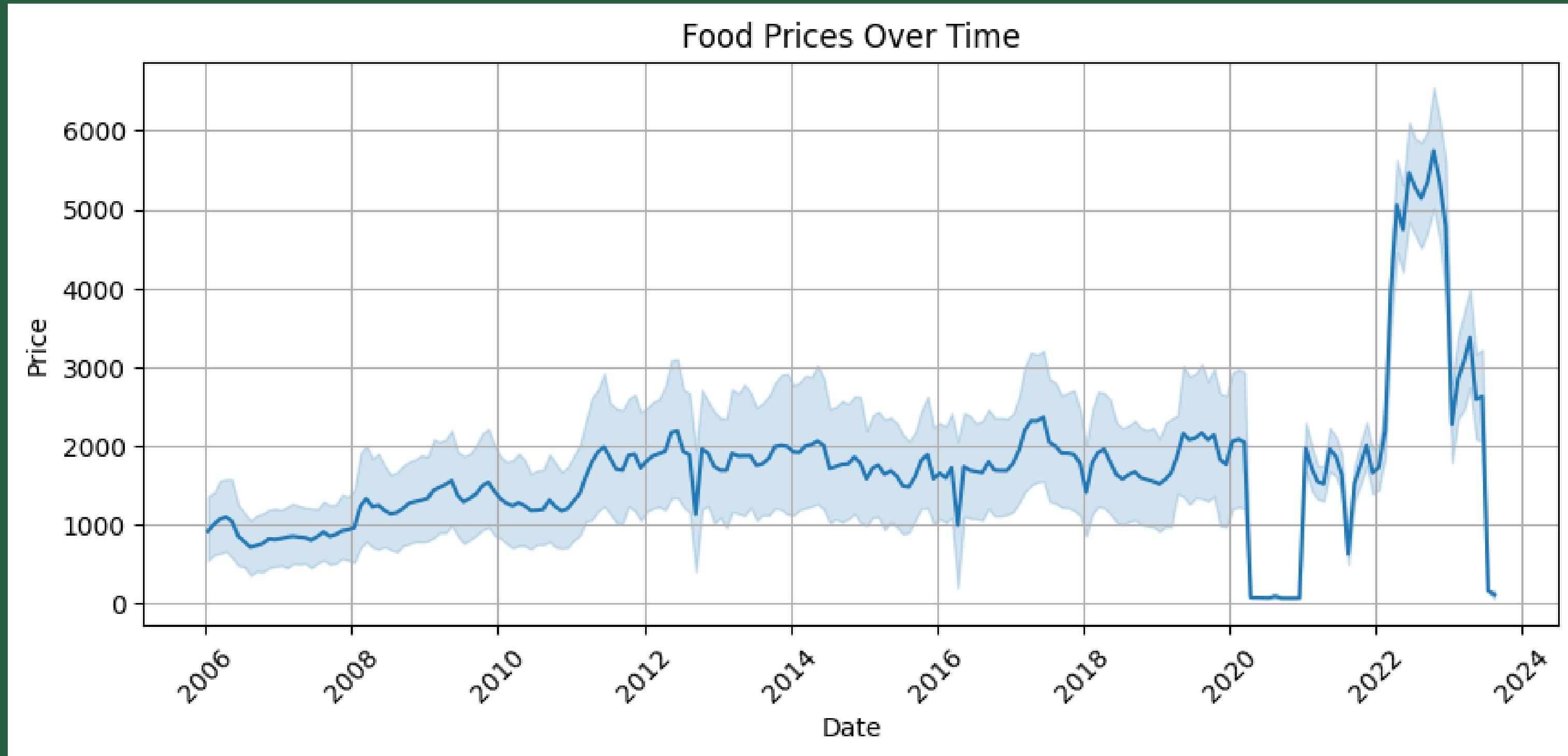
Bivariate Analysis

Inflation Rate Trends



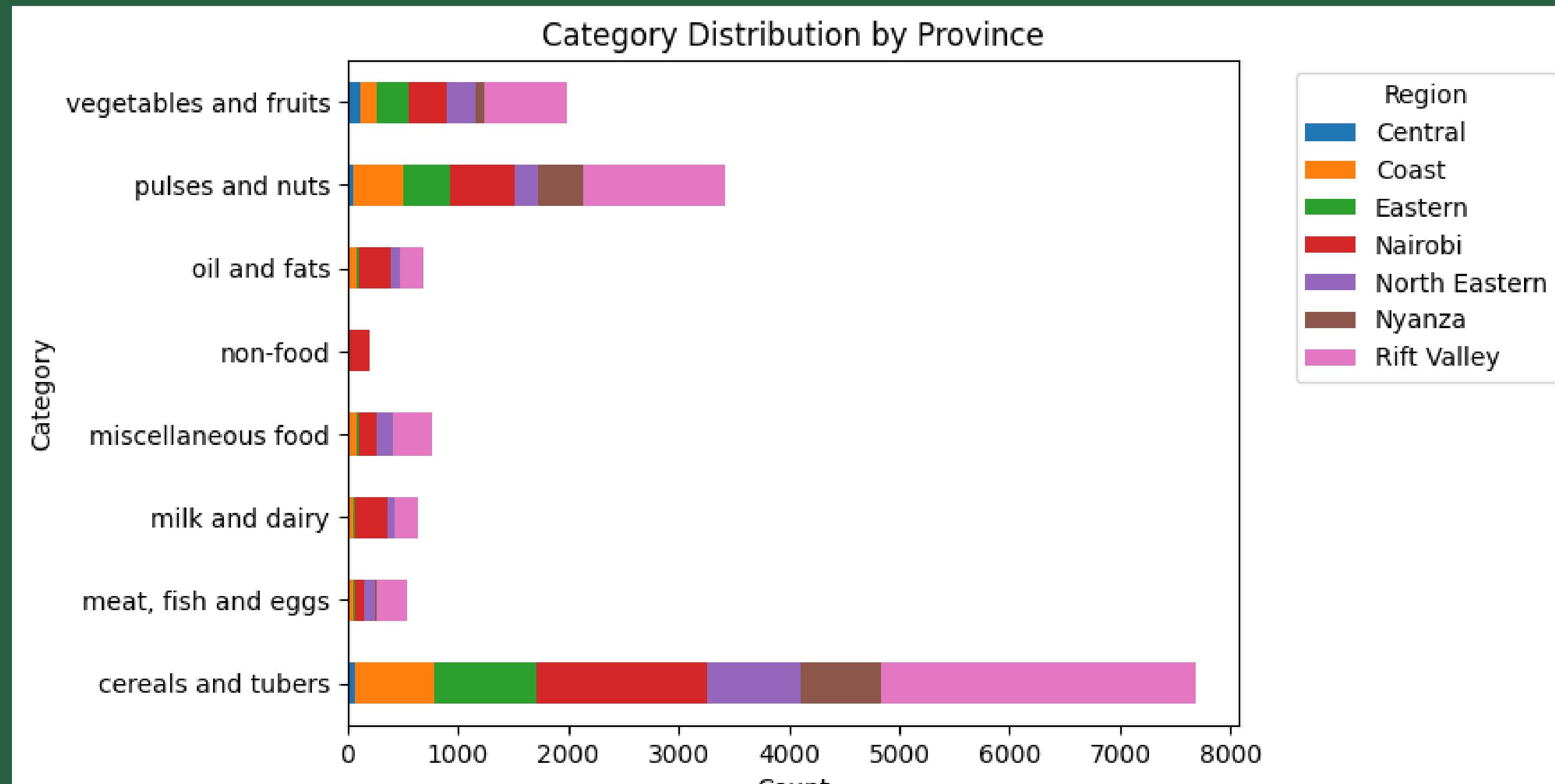
Inflation rates appear to have stabilized between 2013 to date, compared to the years prior, which illustrated large differences between the highest and lowest inflation rates. As a result, inflation rates are more predictable in recent years compared to the earlier years.

Food Prices Trend



There has been a general increase in prices of food commodities over the years except for the gaps noted in 2020/2021 which can be attributed to missing data, data discontinuity, and/or data entry errors in the dataset.

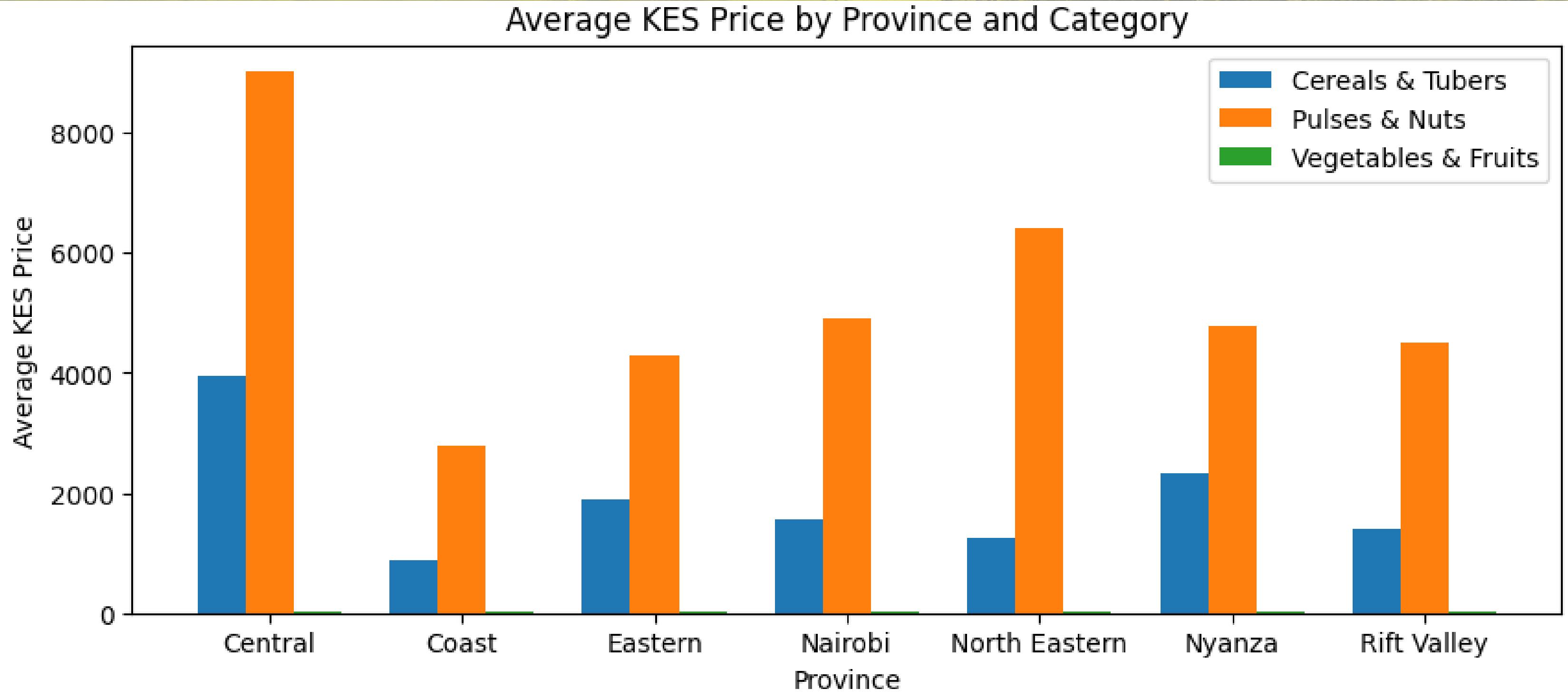
Popular Food Commodities



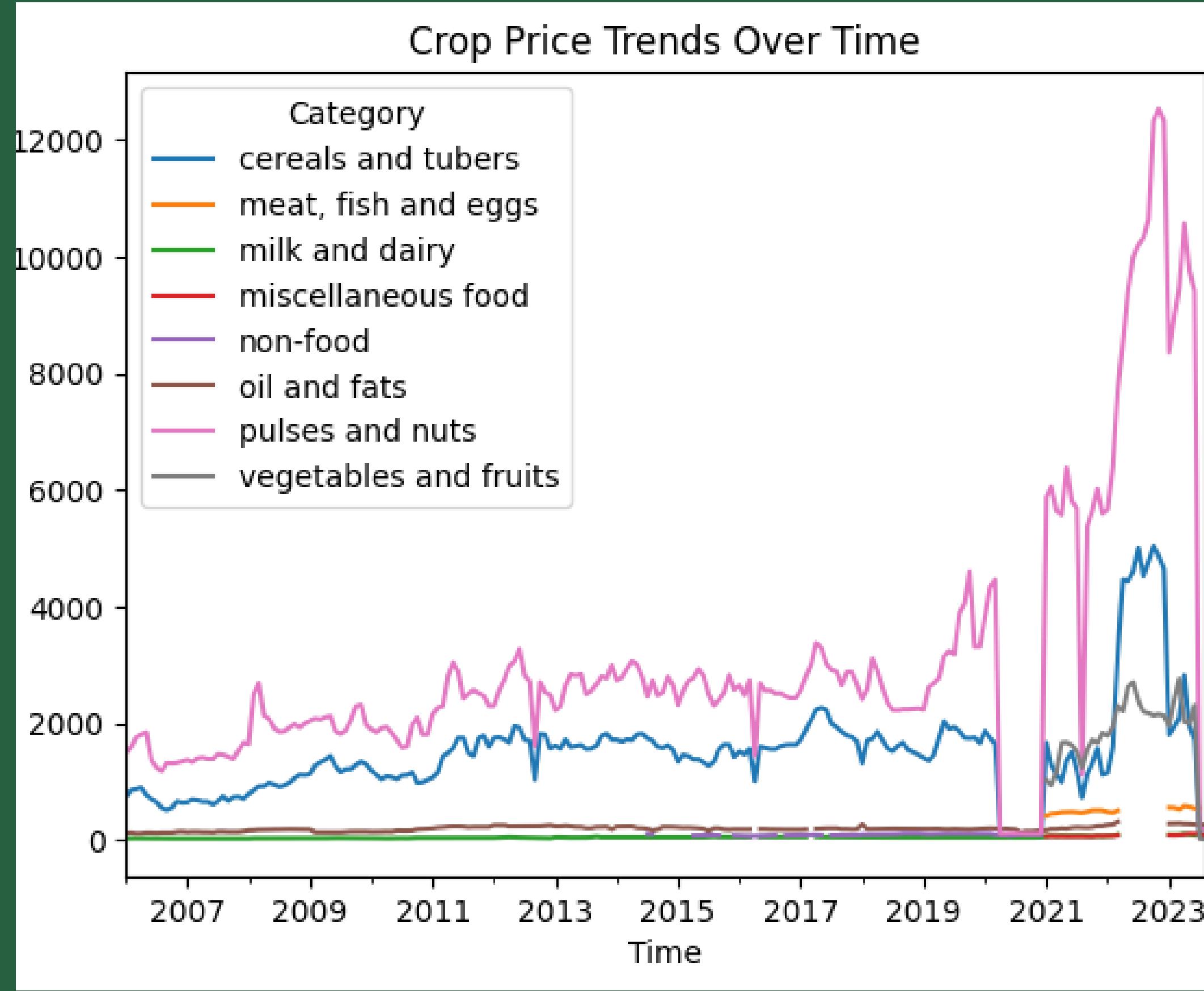
The food categories "cereals and tubers" are prevalent across a wide range of provinces, including Rift Valley, Nyanza, North Eastern, Nairobi, Eastern, Coast, and Central.

Average Price By Province and Food Category

Average KES Price by Province and Category

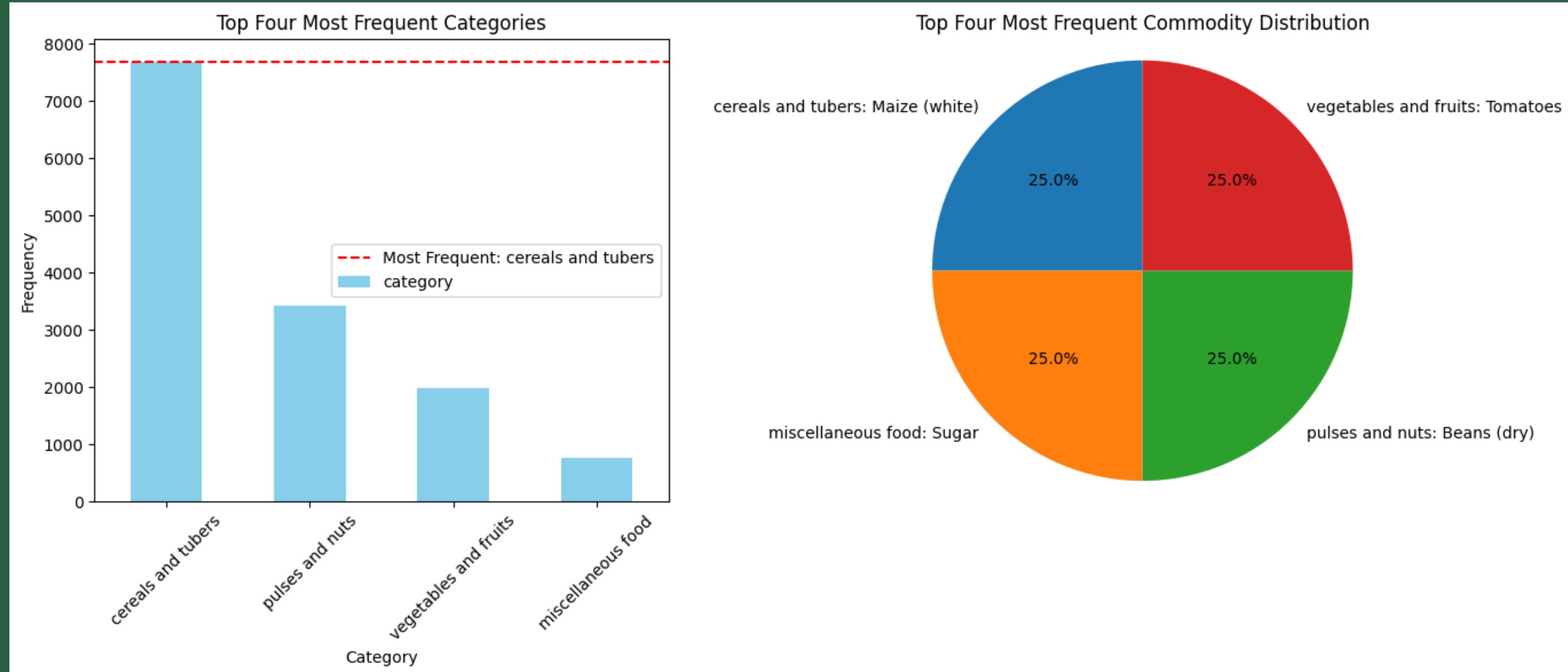


"Pulses and Nuts" tend to have higher prices compared to the other food categories across different regions.



Over the years, there has been a noticeable upward trend in the prices of pulses and nuts, as well as cereals and tubers, whereas the prices for other categories such as milk and dairy have remained relatively stable.

Top food commodities



Based on this we chose to use only maize and beans in our models.

MODELLING

Two models for this project

1. SARIMA

we used the **SARIMA MODEL** due to the presence of seasonality in the data. Mean absolute error (MAE), and mean square error(MSE) were used to measure the performance of the model

2.LSTM

The **LSTM** model, which is a Recurrent Neural Network suitable for time series data, was also used for forecasting. Mean absolute error (MAE), Root Mean Square Error(RMSE), Mean Square Error(MSE) and R-squared (R²) metrics were used to measure the performance of the model



MODEL EVALUATION FOR MAIZE

	SARIMA	LSTM
RMSE	12.17	9.40
MSE	148.20	88.49
MAE	9.30	6.42
R-Squared	0.51	0.57

MODEL EVALUATION FOR BEANS

	SARIMA	LSTM
RMSE	24.36	7.75
MSE	593.48	60.07
MAE	17.75	5.49
R-Squared	0.22	0.71

Conclusions

- Substantial price variability discovered
- Connection between inflation rate and prices of food
- Distinctive food category preferences among Kenyans

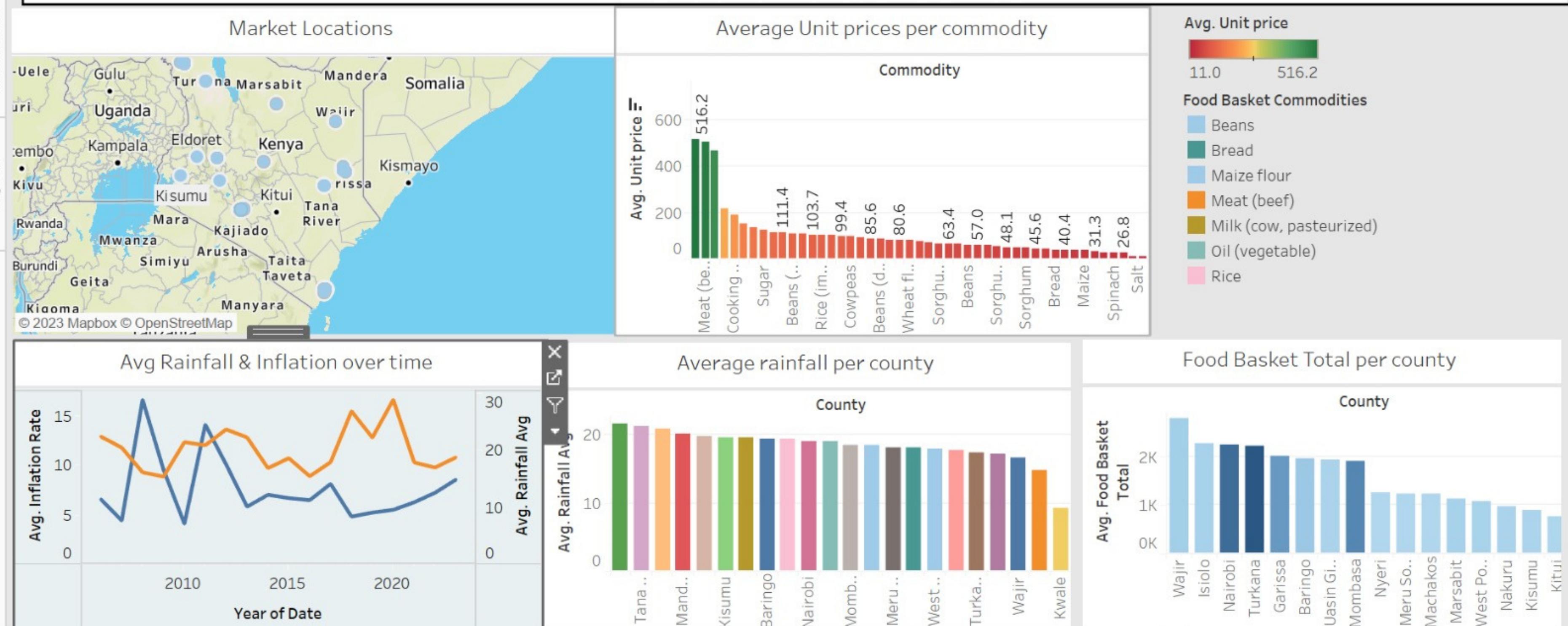
Recommendations

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- Farmers and Retailers should use price forecasts for planning crop strategies.
- Diversifying crop portfolios can help farmers reduce market vulnerability.
- Retailers can explore hedging strategies to manage price risks.
- Government and Policymakers should incorporate price forecasts into food security and agricultural policies.
- To manage rising prices, the government should secure more food commodities.
- Consumers should be mindful of price fluctuations to manage their food budget effectively.

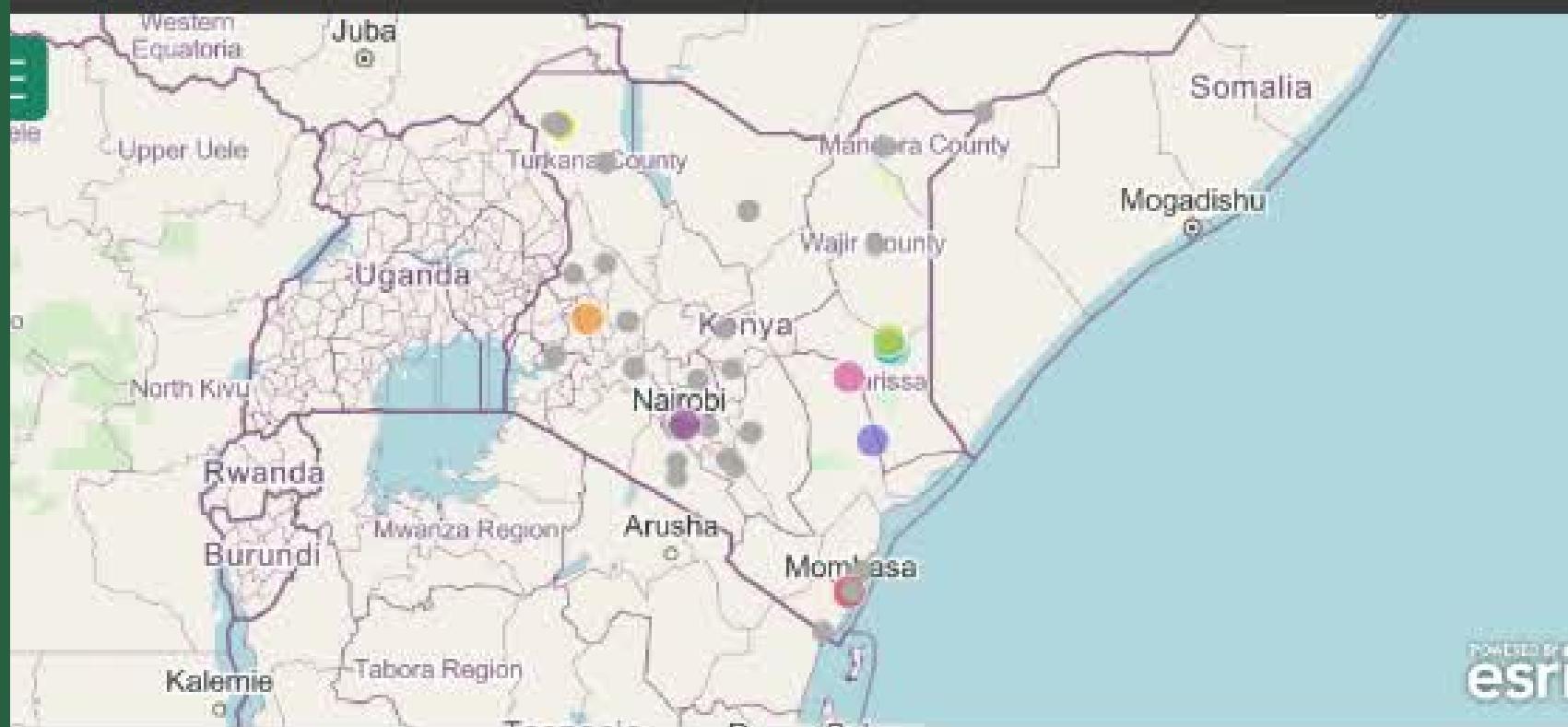
TABLEAU

SOKO Smart Food Prices Dashboard

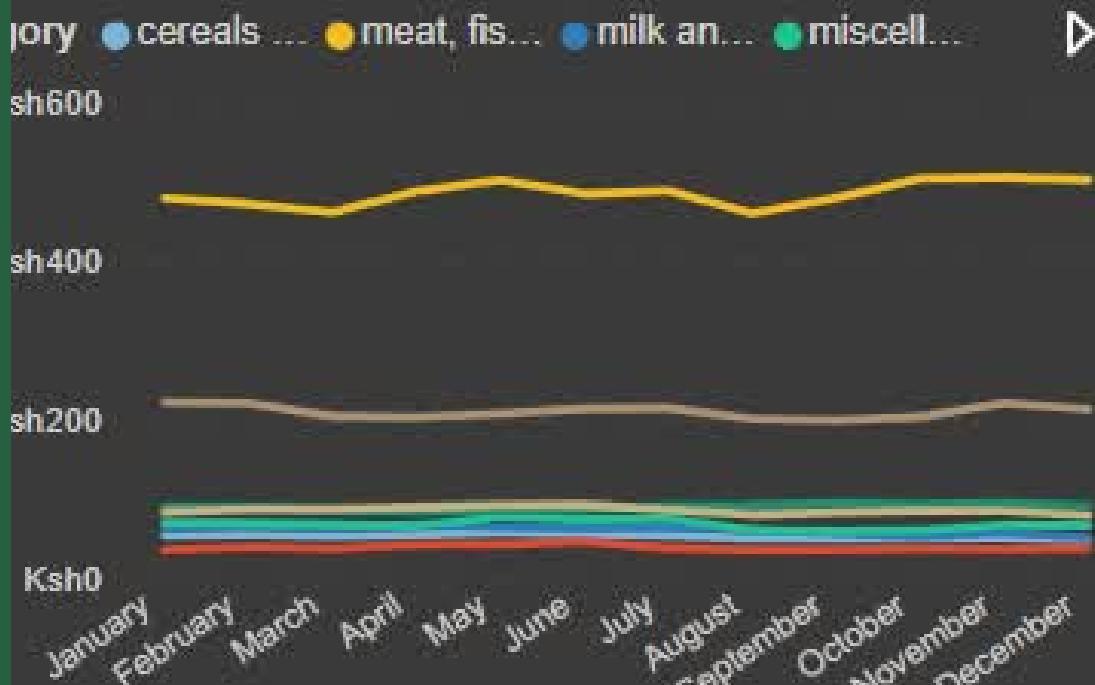


FOOD PRICES OVERVIEW

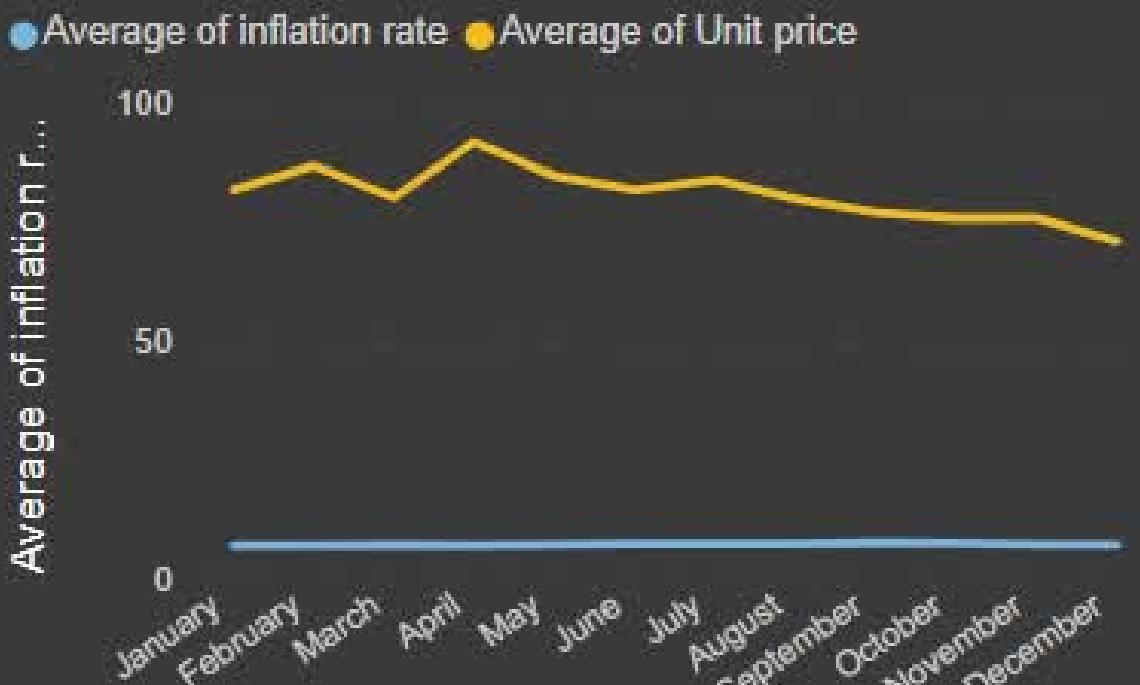
Market distribution of markets



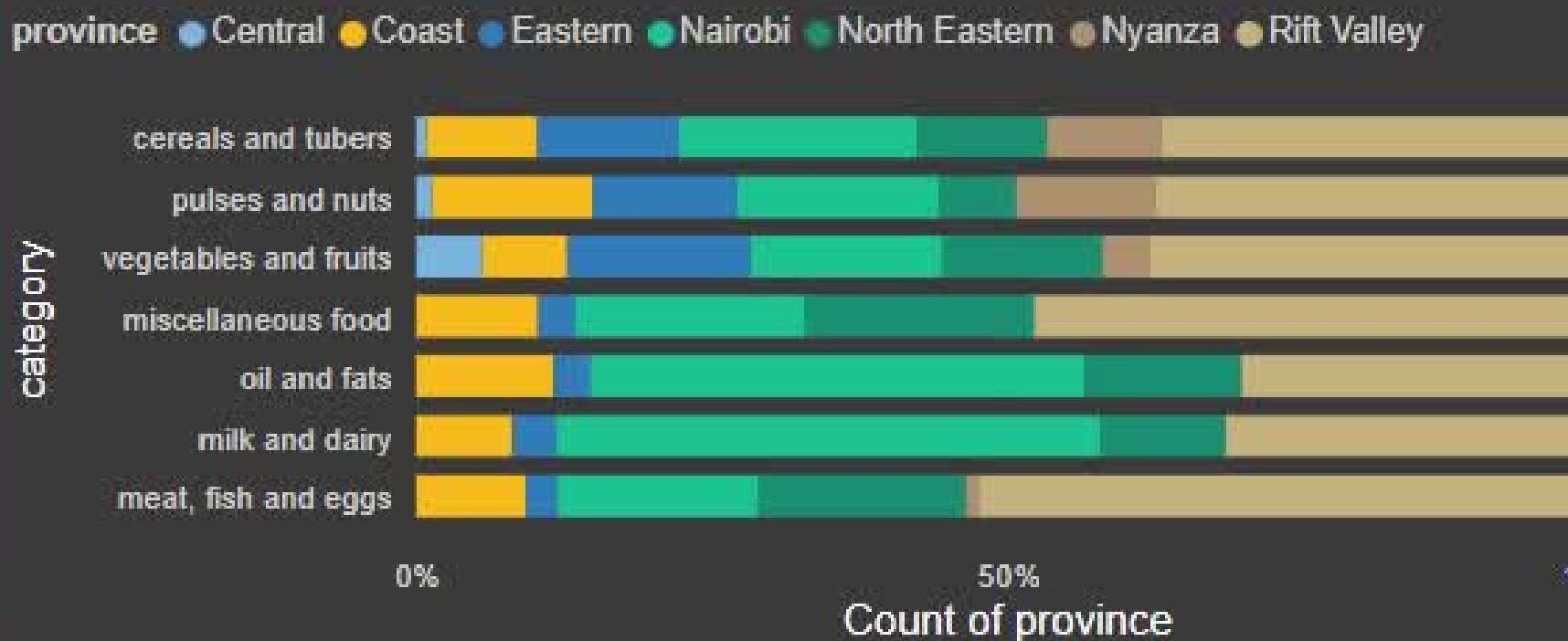
Average of Unit price by Month and category



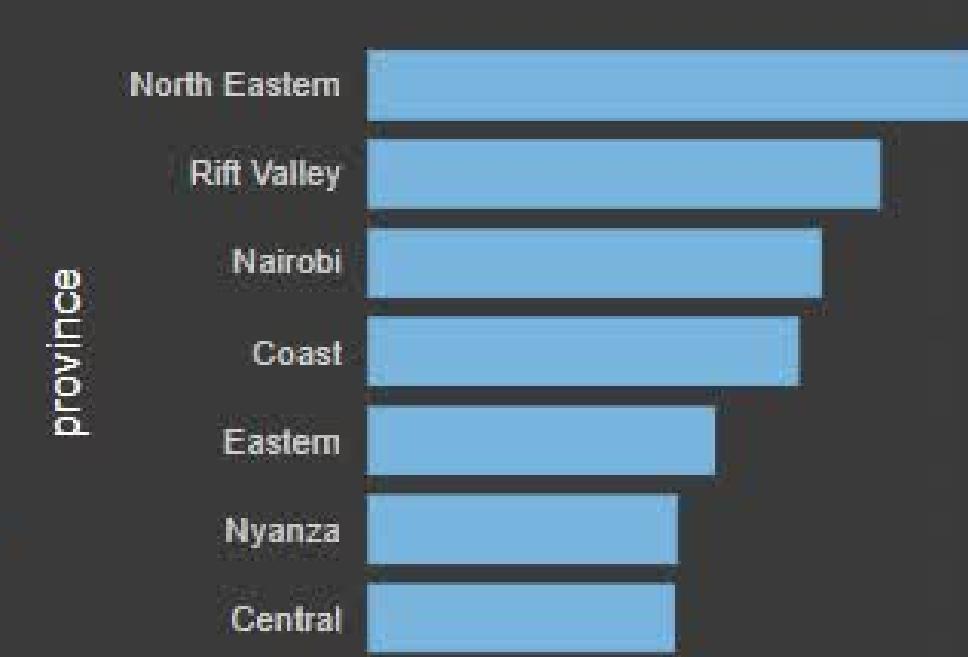
Comparison of Inflation and Prices by Year



Category Distribution by Province



Average of Unit price by province



A blue tractor is positioned in the center-left of a large agricultural field. The field is divided into several rectangular plots, each filled with young green plants, likely seedlings. The tractor has a white roof and two orange lights on top. It is facing towards the left of the frame.

Thank you!

Any Questions ?