Food Security Monitoring Tool for Karamoja, Uganda

Group 9

Overview

Karamoja is the most food-insecure region of Uganda due to low crop productivity caused by intense droughts, pest infestations and disease outbreaks. Although NGOs provide farm inputs and technical support, they lack a clear regional overview and often rely on local information to prioritize their activities. To address this gap, our team at DDI was tasked with developing a **Food Security Monitoring Tool**. Using satellite imagery, the tool estimates yields of the region's two main staple crops — **sorghum and maize** — starting with the 2017 season, providing NGOs with better insights for decision-making and prioritization.

Outline

- Project Goals
- Data
- Methods
- Results
- Conclusions

Project Goals

- Provide NGOs with crop yields for Maize and Sorghum across districts and sub-counties.

- Support better allocation of resources and prioritizing interventions.

- Better understanding of food security patterns.

Data

Datasets from Dalberg Data Insights measuring the yield of the two main staple crops of the region (Maize and Sorghum) based on satellite images for the 2017 crop season.

Includes boundaries on Uganda sub-counties and districts, crop type map for sorghum and maize, yield and population per sub-county and district, average yield for sorghum and maize for sub-counties and districts in Hectares, total crop area for sorghum and maize for sub-counties and districts and total productivity for maize and sorghum for sub-counties and districts.

Methods

Methods used to prepare the data for analysis include:

- Data Cleaning and Preparation.
- Loading shapefiles into GeoPandas.
- Merging crop yield data with geospatial boundaries at sub-county and district levels.
- Checking for missing values and filling NaN values with zero where needed.
- Filtering the data to focus on Karamoja sub-region only.
- Reducing the dataset to 53 sub-counties that are relevant for Karamoja.

Results

Maize Yield/Ha (Subcounty) | Sorghum Yield/Ha (Subcounty)
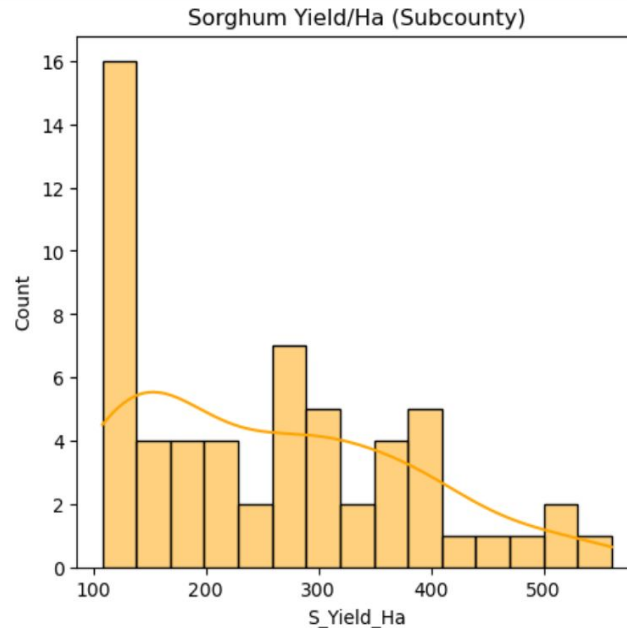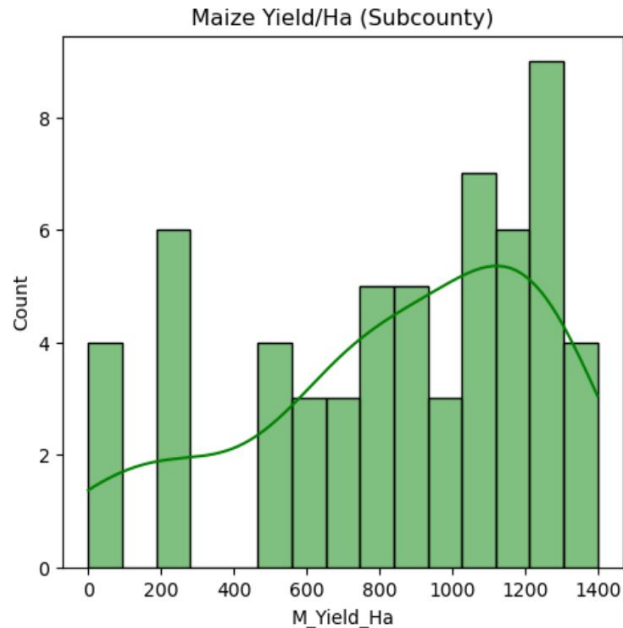
- Maize tends to achieve higher yields in areas with extensive cultivation, whereas sorghum generally performs better in areas with smaller cultivated areas.

Results

Average Maize vs Sorghum Yield per District
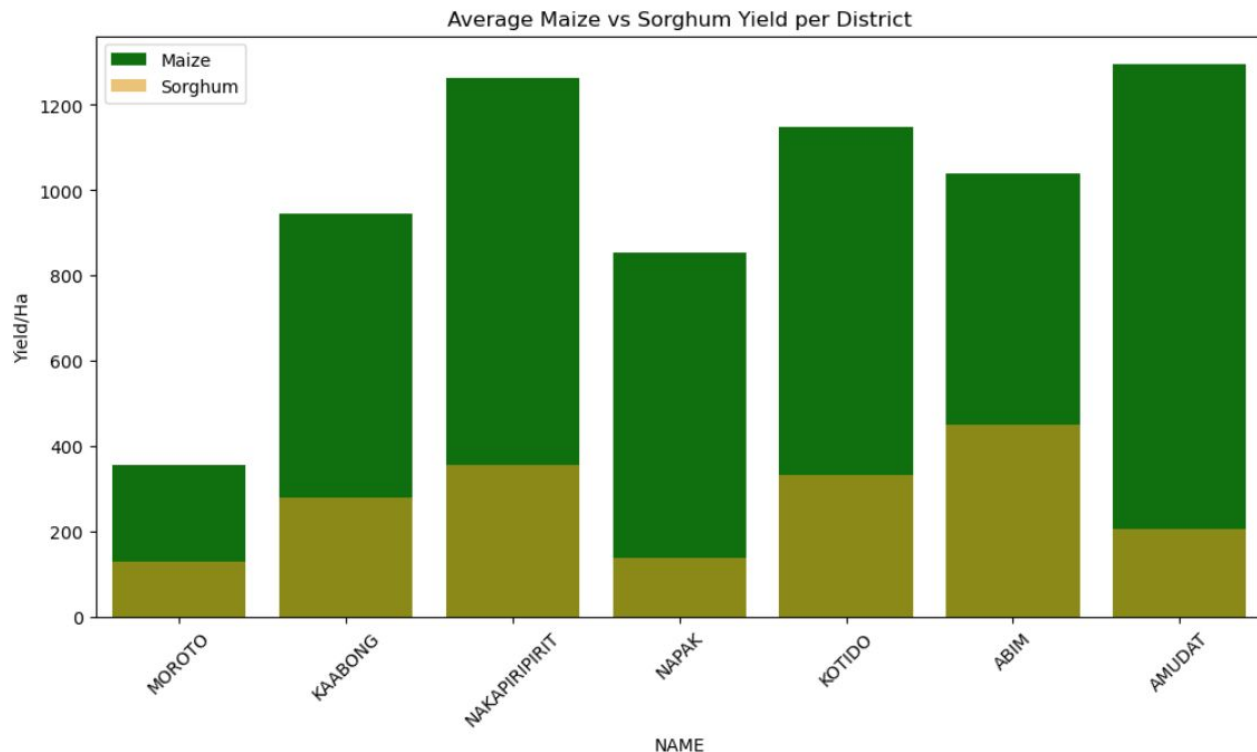
- Across the districts, maize yield per hectare is higher than that of sorghum. In Moroto, however, yields for both maize and sorghum are notably low, posing a significant risk to food security in the area. Targeted interventions are recommended to address this issue.

Results

Average Maize vs Sorghum Production in kg per District
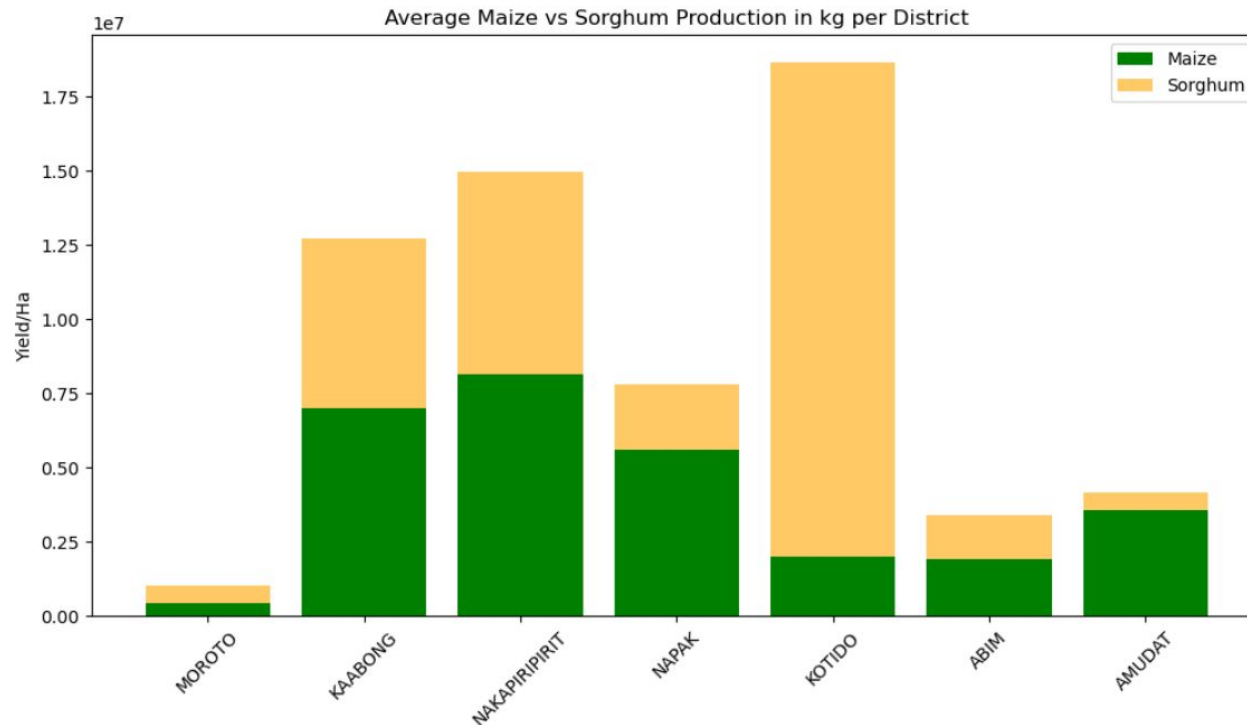
● Although sorghum exhibits lower yields per hectare, its total production across the districts exceeds that of maize. This indicates that, despite lower efficiency per unit area, sorghum remains the dominant crop in terms of overall contribution to regional food supply.

Results

Spatial Distribution of Maize Field Area

Spatial Distribution of Sorghum Field Area
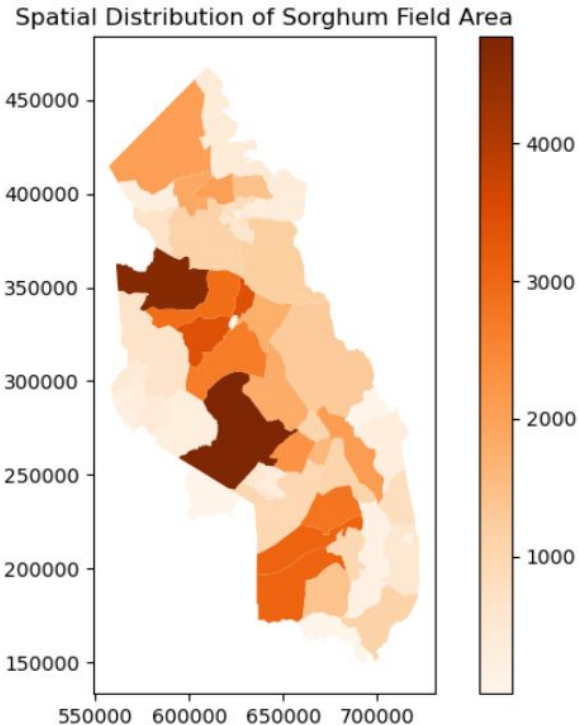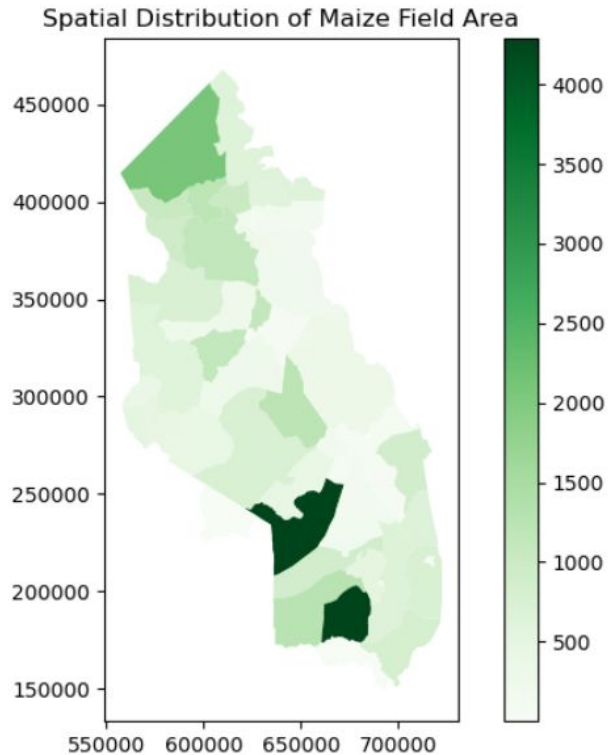
- Sorghum occupies a larger cultivated area than maize, despite maize exhibiting higher yields per hectare in Karamoja. This discrepancy highlights the region's reliance on sorghum for overall food production, even though maize is more productive on a per-hectare basis.

Conclusions

Key Recommendations

- Identify areas where low per-hectare yields combined with high population density may mask food insecurity.
- Allocate resources and support based on both total production and efficiency per hectare, not just field size or population.
- Targeted interventions on underperforming districts and sub-counties (e.g., Moroto, Abim)
- Focus on pest and drought resilience strategies to stabilize yields across districts.
- Increase maize cultivation in high-yield zones while maintaining sorghum to support food security.

Conclusions

Limitations

- Analysis focuses mainly on maize and sorghum; other potential contributors to food security are not considered.
- The analysis is based on the 2017 crop season, limiting trend evaluation.
- Environmental factors (soil quality, rainfall patterns), pest/disease impacts, and socio-economic variables are not fully accounted for.

Conclusions

Future Works

- Extend the analysis to include other staple crops and multiple growing seasons for more comprehensive insights.
- Develop predictive models to forecast yields and identify potential food insecurity hotspots.
- Examine the influence of population density, market access, access to inputs and farm management practices on productivity.

Thank You!