KENYA FOOD SECURITY EARLY WARNING SYSTEM

USER MANUAL

Predict food insecurity risk — up to 3 months before it happens

Coverage	**47 Kenyan Counties**
Historical Data	**2019 – 2025**
Prediction Horizon	**Up to 3 Months Ahead**
Model Accuracy	**87.5% Recall on Crisis Events**

Built on real IPC assessments, WFP market price data, and CHIRPS satellite rainfall records.

Table of Contents

SECTION 1 — WHAT THIS APP DOES

Overview

This is a **Machine Learning Early Warning System** that predicts food insecurity risk across all 47 Kenyan counties — up to 3 months before a crisis is formally declared. It is designed to help humanitarian organizations and county governments **act early, not after the fact.**

> **The core idea:** Food crises do not appear overnight. Early warning signals — rainfall failure, rising food prices, seasonal lean periods — show up weeks or months before people go hungry. This app reads those signals and tells you where to act first.

Who Is This For?

Role	How They Use It
Field Workers & NGO Officers	Run quick scenario checks before deploying resources
County Government Officials	Monitor their county's risk month by month
Humanitarian Coordinators	Prioritize which counties need attention first
Food Security Analysts	Explore historical trends and seasonal patterns

SECTION 2 — THE THREE PAGES AT A GLANCE

App Navigation

The app has three main sections, accessible from the top navigation bar. Each page serves a different purpose.

Page	Purpose	Best Used For
County Map (Baseline)	Shows all 47 counties color-coded by structural risk	Getting a quick overview of which areas are chronically vulnerable
Predict (Scenario Tool)	Enter current conditions for any county and get an instant risk score	Field assessments, pre-deployment planning, budget decisions
Trends (History)	See how food insecurity has changed in any county from 2019 to 2025	Understanding patterns, briefing reports, monitoring progress

County Map — Color Guide

Counties are color-coded by their baseline structural risk. This reflects long-term vulnerability, not a single month's conditions.

Color	Risk Level	Typical Counties
Red	High Chronic Risk	Mandera, Wajir, Turkana, Marsabit
Orange	Elevated Risk	Garissa, Isiolo, Tana River
Yellow	Moderate Risk	Various mixed-livelihood counties
Green	Low Risk	Nairobi, Kiambu, Meru

SECTION 3 — THE PREDICT TOOL: STEP BY STEP

How to Run a Prediction

The Predict page is the main tool of this app. Follow these steps each time you want to assess a county.

Step 1	**Select a County** Choose any of the 47 Kenyan counties from the dropdown menu. The app automatically loads that county's pre-set vulnerability data.
Step 2	**Set the Assessment Month** Choose the month you are assessing. This is important — the model accounts for seasonal lean periods (January and July are historically the most dangerous months).
Step 3	**Enter Previous Crisis Status** Was this county in food crisis at the last assessment? Select Yes or No. This is the single most important input.
Step 4	**Enter Last Month's Rainfall** Select whether rainfall last month was: Below Normal, Normal, or Above Normal, based on field observation or weather data.
Step 5	**Enter Rainfall 3 Months Ago** Select the rainfall condition from 3 months ago. This captures the delayed impact of a failed rainy season on current food stocks.
Step 6	**Enter Food Basket Cost** Select whether the cost of staple foods (maize and beans) in local markets is: Normal, Elevated, or High, relative to that county's usual price levels.
Step 7	**Click Predict** Press the Predict button. The model returns a result instantly.

SECTION 4 — THE 5 PREDICTION INPUTS EXPLAINED

Understanding Each Input

Each input was chosen because it has a real, measurable connection to food insecurity. This section explains what each one means and why it matters.

1 Previous Crisis Status

Question asked: "Was this county in food crisis at the last IPC assessment?"

This is the strongest predictor in the entire model. Food insecurity is persistent — counties that were in crisis almost always remain in crisis unless major interventions occur. A Yes answer dramatically raises the predicted risk.

***Tip:** If you do not have the previous IPC report, check with your county food security office or the NDMA county reports.*

2 Rainfall Last Month

Question asked: "Was rainfall last month below normal, normal, or above normal?"

Low rainfall directly reduces crop production and livestock survival. However, its effect on food supply takes 1 to 3 months to appear — so last month's rainfall predicts next month's food stress, not the current moment.

***Tip:** Use CHIRPS satellite data, KMD county reports, or field observation from your team.*

3 Rainfall 3 Months Ago

Question asked: "What was the rainfall condition 3 months ago?"

This captures the delayed impact of drought on food stocks. If the rainy season failed 3 months ago, crops have already failed and household food reserves are now depleting. This input is often a stronger crisis predictor than current rainfall.

***Tip:** Look at rainfall records from the previous quarter or reference NDMA monthly bulletins.*

4 Food Basket Cost

Question asked: "Is the cost of maize and beans normal, elevated, or high compared to usual levels?"

Measures whether staple foods are affordable in local markets. Even when food is physically available, high prices mean poor households cannot buy enough to eat. Elevated or high prices signal an active food access crisis.

***Tip:** Use WFP market price monitoring data or local market surveys. Each county has its own normal price range built into the model.*

5 Assessment Month

Question asked: "Which month are you assessing?"

Food insecurity follows predictable seasonal cycles in Kenya. January and July — the months just after the two main dry seasons — are historically the most dangerous periods. The model automatically adjusts for this lean season effect.

Tip: *Always use the actual current month, not the month of the most recent field visit.*

SECTION 5 — UNDERSTANDING YOUR RESULTS

What the Prediction Output Means

After you click Predict, the app returns two pieces of information: a risk probability and an IPC phase.

Risk Probability

This is a number between 0% and 100% — the model's estimate of the likelihood that this county is currently experiencing or about to experience a food security crisis. A higher number means greater risk and greater urgency to investigate further.

IPC Phase Classification

The Integrated Food Security Phase Classification (IPC) is the international standard used by governments and aid agencies to define severity of food insecurity. The app maps the predicted risk to the relevant IPC phase.

IPC Phase	Name	What It Means
Phase 1	Minimal	Households can meet basic food needs without atypical coping strategies
Phase 2	Stressed	Some difficulty meeting minimum food needs — monitor closely
Phase 3	Crisis	Food consumption gaps and acute malnutrition — intervention needed
Phase 4	Emergency	Severe food consumption gaps — emergency response required
Phase 5	Catastrophe	Extreme food deprivation — life-threatening conditions

Important: A high risk score does not automatically mean a crisis is confirmed. It means the conditions are consistent with crisis risk. Always validate with field data before making resource decisions.

SECTION 6 — THE COUNTY MAP

Baseline Risk Overview

The County Map page gives you an immediate visual overview of structural food insecurity risk across all 47 counties. This is not a real-time forecast — it reflects each county's chronic, underlying vulnerability based on long-term factors.

What Drives the Baseline Color?

Each county's baseline color is determined by its vulnerability score, which combines two data sources:

Factor	What It Measures
MPI Poverty Index	The Multidimensional Poverty Index — measures poverty across health, education, and living standards, not just income
Severe Poverty Rate	The percentage of the county population living in extreme poverty
ASAL Classification	Whether the county is Arid or Semi-Arid Land — a key structural driver of food insecurity in Kenya

How to Use the Map

Use the county map as your starting point. Red and orange counties should be your first priority when resources are limited. Click any county to see its full vulnerability profile before moving to the Predict page for a scenario-based assessment.

> **Note on ASAL counties:** Arid and Semi-Arid Land counties (covering roughly 80% of Kenya's land area) are structurally more vulnerable due to dependence on rain-fed agriculture and pastoralism. The model treats ASAL status as a significant background risk factor.

SECTION 7 — TRENDS: HISTORICAL VIEW

Tracking Change Over Time

The Trends page shows how food insecurity has evolved in any county from 2019 to 2025. This view is useful for understanding whether a county is improving, worsening, or stuck in a cycle of chronic crisis.

What the Trends Page Shows

Metric	What It Tells You
Risk Score Over Time	A month-by-month line chart of the county's predicted food insecurity risk from 2019 to 2025
Peak Risk	The worst single month on record for that county — important for understanding maximum historical exposure
Average Risk	The typical baseline risk level — useful for identifying counties in chronic distress vs temporary crisis
Months in Crisis	The total number of months the county has spent at IPC Phase 3 or above
Trend Direction	Whether conditions are generally improving or worsening over the most recent 12-month period

Typical Use Cases for the Trends Page

Before writing a county briefing or situation report, use the Trends page to get the historical context quickly. You can identify whether a current spike is unusual or part of a regular seasonal pattern. It is also useful for tracking the effectiveness of past interventions — if a county shows a consistent downward trend after a major program, the data should reflect that.

SECTION 8 — HOW THE MODEL WORKS

Behind the Scenes

You do not need to understand the model in detail to use the app. This section is for users who want to know what is happening under the surface.

Training Data

Data Source	What It Covers
IPC Food Security Assessments	Official food security phase classifications across 31 Kenyan counties, 2019–2025
WFP Market Price Data	Monthly retail prices for maize and beans in county markets
CHIRPS Satellite Rainfall Records	Monthly rainfall measurements derived from satellite imagery — not dependent on ground stations

Automatic Inputs (Not Asked From the User)

For every county, the model automatically loads two background factors that the user does not need to enter manually:

— **County Vulnerability Score:** A composite of the MPI poverty index and severe poverty rate, pre-calculated for every county.

— **ASAL Classification:** Whether the county is classified as Arid or Semi-Arid Land. This significantly increases baseline predicted risk.

Model Performance

Metric	Value	What It Means
Recall	87.5%	The model correctly identifies 87.5% of all real food crises before they are formally declared
Coverage	31 Counties	Trained on data from 31 counties; applied across all 47 using vulnerability profiles
Horizon	Up to 3 Months	The model can predict risk up to 3 months ahead based on current conditions

SECTION 9 — IMPORTANT LIMITATIONS

What This App Cannot Do

This tool does not replace field assessment. It gives decision makers an evidence-based signal of where to look first — so that limited humanitarian resources reach the right counties at the right time.

! **It cannot confirm a crisis**
A high risk score means conditions match those of past crises. Only a formal IPC assessment with field verification can confirm actual crisis status.

! **It does not capture sudden shocks**
The model is trained on gradual patterns — rainfall cycles, price trends, seasonal effects. A sudden flood, conflict outbreak, or disease event may not be captured until it shows up in market prices or the next assessment.

! **It does not predict exact numbers**
The output is a risk probability and IPC phase classification. It does not predict the exact number of people affected or the precise severity within a phase.

! **It covers county level, not sub-county**
Risk is assessed at the county level. Within-county variation — between urban and rural areas, or across different livelihood zones — is not captured.

! **Input quality affects output quality**
If the rainfall or price data you enter is inaccurate or based on guesswork, the prediction will reflect that. Use reliable, verified data sources wherever possible.

SECTION 10 — QUICK REFERENCE CARD

At-a-Glance Summary

Input	Options	Why It Matters
Previous Crisis	Yes / No	Strongest single predictor — crises persist
Rainfall Last Month	Below Normal / Normal / Above Normal	Affects food supply 1–3 months later
Rainfall 3 Months Ago	Below Normal / Normal / Above Normal	Captures delayed drought impact on stocks
Food Basket Cost	Normal / Elevated / High	Measures food affordability in local markets
Assessment Month	Any month (Jan–Dec)	Accounts for seasonal lean periods

Key Terms

Term	Definition
IPC	Integrated Food Security Phase Classification — the international standard for measuring food crisis severity (Phases 1–5)
ASAL	Arid and Semi-Arid Land — county classification indicating high structural vulnerability
MPI	Multidimensional Poverty Index — measures poverty across health, education, and living standards
CHIRPS	Climate Hazards Group InfraRed Precipitation with Station data — satellite-based rainfall records
WFP	World Food Programme — source of market price monitoring data used in model training
NDMA	National Drought Management Authority — Kenya's body for drought and food security monitoring

Recall	In machine learning, the percentage of real crisis events that the model correctly identifies