

# Final Project Proposal

Proposed Project Title:

*Rice Price Forecasting and Rule-Based Advisory System for Food Security in the Philippines*

Selected SDG Goal(s):

**SDG 2** – Zero Hunger

**SDG 8** – Decent Work and Economic Growth

## Problem Statement / Rationale:

Rice is the staple food of the Philippines and a key indicator of national food security. However, the country faces frequent price fluctuations due to seasonal production, weather variability, and import dependency. Sudden price surges negatively impact consumers and low-income households, while falling prices reduce farmers' income stability.

This project aims to address this problem by developing a **machine learning model** that forecasts monthly rice retail prices, complemented by a **knowledge-based reasoning system** that provides data-driven advisories. The goal is to support farmers, policymakers, and

## Objectives of the Project:

1. Develop a machine learning model to forecast monthly rice prices based on historical and economic indicators.
2. Create a rule-based reasoning module that interprets price trends and generates practical advisories (e.g., optimal selling, import timing).
3. Integrate the model and rule base into a simple, interactive dashboard for visualization and user access.
4. Evaluate how the system contributes to achieving the UN Sustainable Development Goals (SDG 2 and SDG 8).

## Scope and Limitations:

The model will utilize **publicly available datasets** from the **Philippine Statistics Authority (PSA)**, **World Food Programme (WFP)**, and **World Bank** containing **monthly rice retail prices (2005–2024)**.

The focus is on national and regional-average prices, not barangay-level fluctuations. Forecasts will be limited to short-term (1–3-month ahead) projections. The reasoning component will provide advisories based on data-driven rules but not serve as an economic recommendation engine or market policy simulator.

## Proposed Machine Learning Approach:

We will experiment with **Linear Regression**, **Random Forest Regressor**, and **LSTM (Long Short-Term Memory)** models for time-series forecasting.

- **Pre-processing:** handling missing values, normalization, feature engineering (e.g., rainfall, inflation, import volume).
- **Evaluation Metrics:** Root Mean Square Error (RMSE) and  $R^2$  score to measure forecast accuracy.
- **Model Output:** next-month average retail price of well-milled rice (₱/kg).

## Knowledge Representation & Reasoning (KRR) Approach:

A **forward-chaining rule-based system** will interpret the ML results and external factors to generate human-readable advisories.

### Example Rules:

- IF forecasted price  $\uparrow$  AND rainfall  $\downarrow$  THEN advisory = "Prepare for lean supply; prioritize imports or storage."
- IF forecasted price  $\downarrow$  AND production  $\uparrow$  THEN advisory = "Encourage local market sales to balance inventory."
- IF inflation > 5% THEN advisory = "Implement price monitoring mechanisms."
- IF import volume decreases AND demand increases THEN "Warn traders of potential supply gaps."
- IF consecutive months show rising prices THEN "Recommend early intervention from LGUs and DA."

### Target Users / Stakeholders:

- Local farmers and traders (for planning production and storage)
- LGUs and DA field offices (for monitoring and intervention)
- Consumers and retailers (for market awareness)

### Expected Output / Deliverables:

- Literature review (local + international)
- Cleaned and merged rice price dataset (monthly interval)
- ML forecasting notebook with evaluation metrics
- Rule-based reasoning system integrated in a web interface
- Reflection and SDG alignment report

### Tentative Tools and Technologies:

Python 3, pandas, scikit-learn, TensorFlow/Keras, Flask or Streamlit, JSON for rule storage, HTML/CSS for dashboard.

## **Proposed Timeline (9 Weeks):**

### **Week Task**

- 1–2** Proposal writing and literature review
- 3–4** Dataset collection, cleaning, and exploratory analysis
- 5–6** Model development and evaluation
  - 7** Rule-based reasoning integration
  - 8** Dashboard deployment and user testing
  - 9** Final documentation and presentation

## **Team Members:**

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## **Instructor Feedback / Approval:**