

ICT-Enabled Food Price Forecasting System for Food Security in the Philippines

John A. Bacus, PhD



MAPUA
MALAYAN COLLEGES
MINDANAO



Background :

Food price volatility poses a major threat to food security in the Philippines. (PSA, 2025).

Montano, 2025

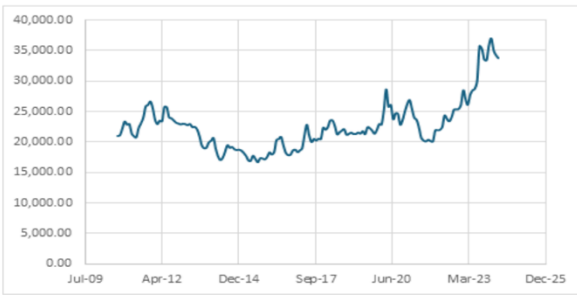


Figure 2. Rice Price from September 2010 to April 2024

Empirical studies confirm the high volatility of domestic food prices. Montano, 2025 found strong persistence and seasonal effects in price behavior from Oct 1994 to Apr 2024.

From the demand side, research shows that Filipino households display relatively inelastic demand for rice (income elasticity ~0.26), indicating that consumers cannot easily reduce rice consumption when prices rise—intensifying vulnerability to price shocks (Valera et.al., 2022).

PHILIPPINES MOST FOOD INSECURE IN EAST AND SOUTHEAST ASIA

The Philippines placed 146th out of 171 countries in the Global Food Security Index Q2 2022 developed by consultancy agency Deep Knowledge Analytics. The index was constructed from 40 food security indicators divided into three main dimensions: food accessibility; crisis level; and food system and economy resilience. With an overall food security index score of 5.05 out of the possible 10, the Philippines ranked last among its peers in the East and Southeast Asia.

Q2 2022 Food Security Index Overall Scores of East and Southeast Asia Countries

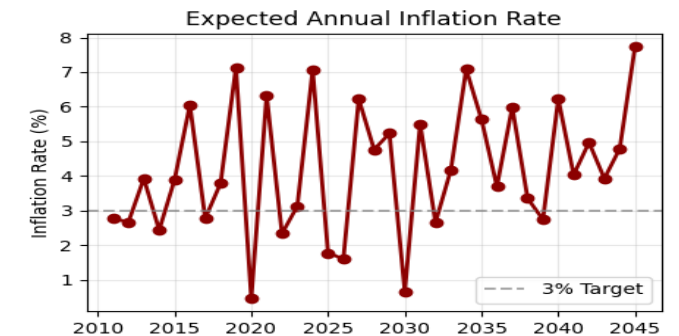
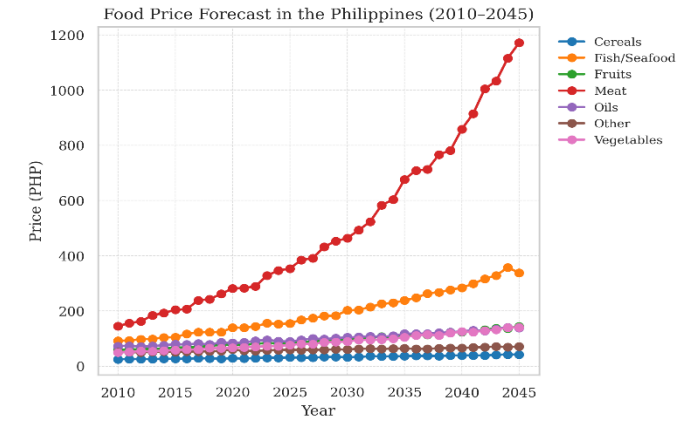
Rank (Out of 171)	Country	Overall Score (Out of 10)
1	United States	7.90
2	Norway	7.89
3	Ireland	7.82
4	Netherlands	7.79
5	Canada	7.79
6	Germany	7.75
7	France	7.54
8	New Zealand	7.52
9	Poland	7.50
10	Finland	7.49
171	Somalia	2.97
170	Dem. Rep. of the Congo	3.75
169	Mozambique	3.76
168	Central African Republic	3.79
167	Afghanistan	3.79
166	Burkina Faso	4.05
165	Nigeria	4.11
164	South Sudan	4.15
163	Niger	4.24
162	Chad	4.28
146	PHILIPPINES	5.05

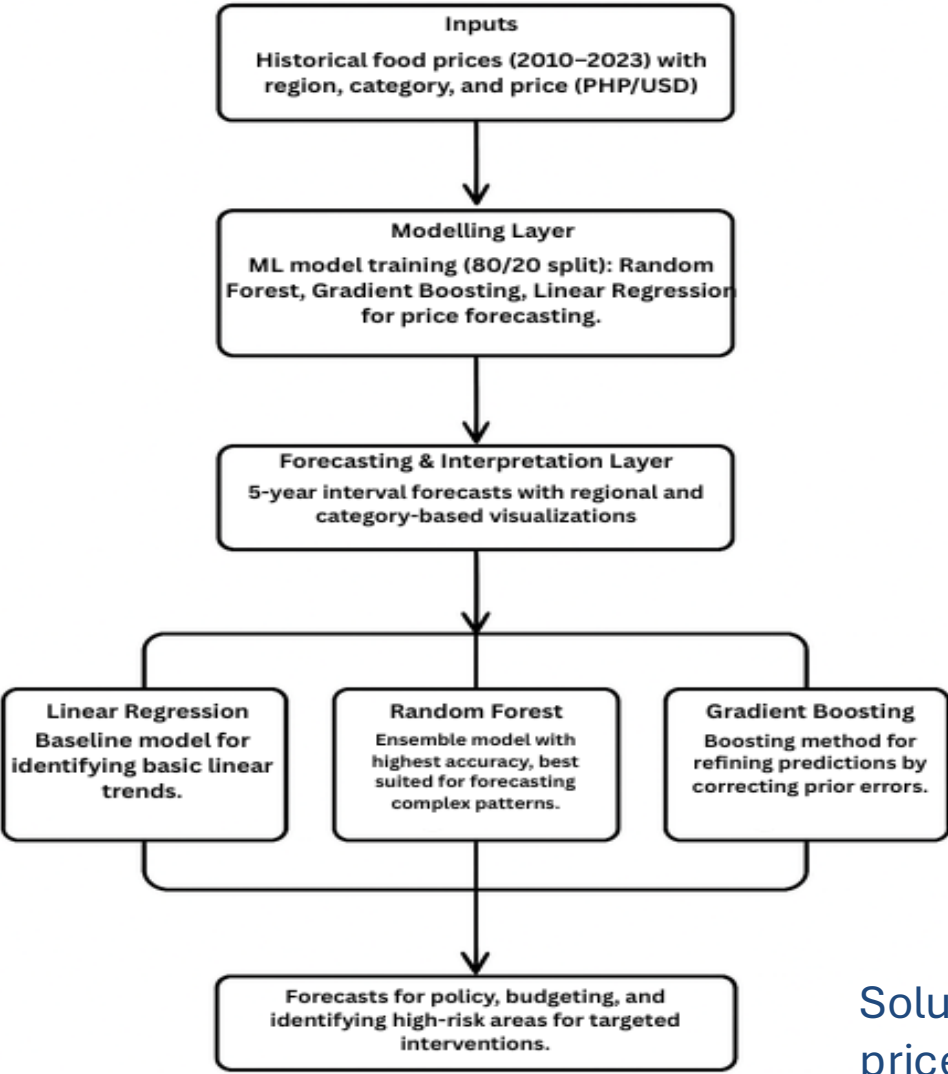
NOTES:
 - The index identifies countries at risk for humanitarian emergencies and disasters that could overwhelm current national response capacity and therefore lead to a need for international assistance. It covers three main dimensions:
Access to Food - measures ease of access to sufficient and nutritious food that meets people's dietary needs for a healthy and active life.
Crisis Level - assesses a country's exposure to the impacts of a changing climate, sociological or biological hazards.
Food System and Economy Resilience - evaluates resources available that can alleviate the impact of global food crisis.
 - According to the report, the global food system has been destabilized by the recent Russian invasion of Ukraine, and levels of hunger and existing acute food insecurity are expected to increase even further by the end of 2022.
 - The report is based on data collected until July 1, 2022.
 SOURCE: DEEP KNOWLEDGE ANALYTICS' GLOBAL FOOD SECURITY 2022 BUSINESSWORLD RESEARCH ABIGAIL MARIE P. YRAOLA BUSINESSWORLD GRAPHICS: BONG R. FORTIN



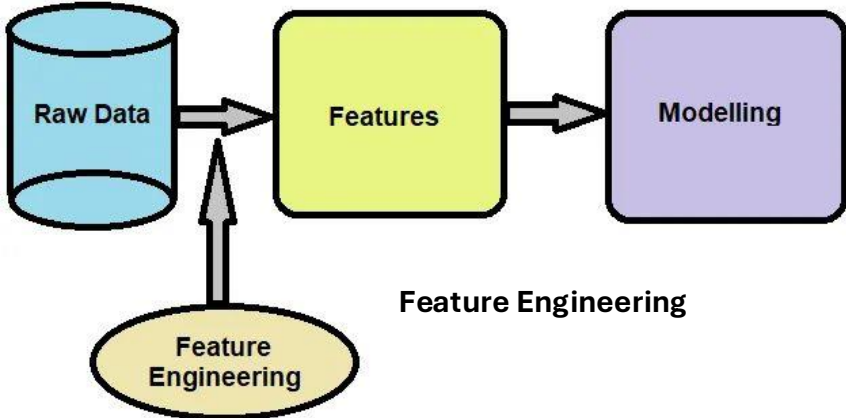
Targets:

- Primary goal: To develop a predictive model capable of forecasting long-term food prices in the Philippines using historical data and machine learning techniques.
- Specific Targets
 - Develop and evaluate predictive models (Random Forest, Gradient Boosting, Linear Regression) for accurate long-term food price forecasting in the Philippines.
 - Analyze regional and categorical drivers of food price fluctuations (commodity type, seasonality, geography) to generate interpretable and policy-relevant insights.
 - Design and implement an ICT-based forecasting platform, integrating machine learning outputs into a user-friendly dashboard for policymakers, farmers, and traders.
 - Facilitate regional knowledge transfer and collaboration, sharing methodologies, datasets, and tools with ASEAN partners to enable adaptation in diverse contexts.





Food Price Forecasting Framework



Feature Engineering

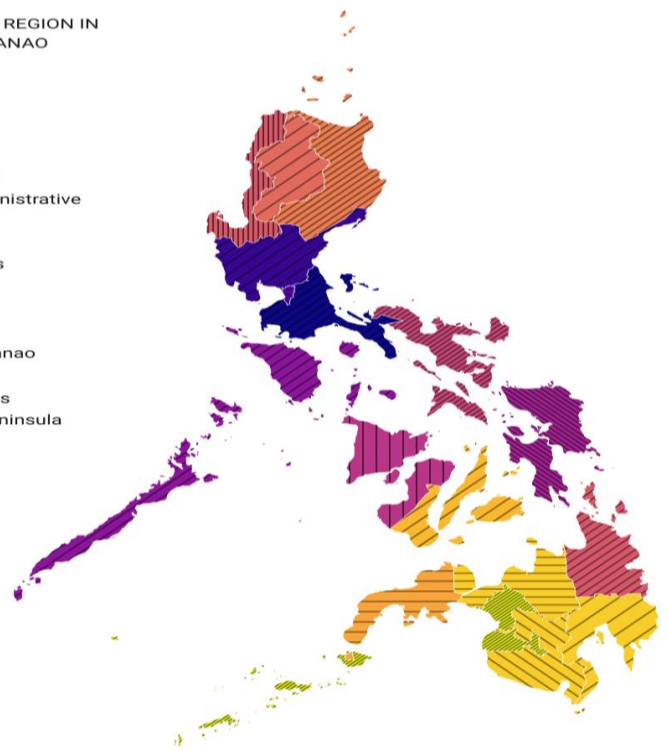
Solution 1: Develop and evaluate predictive models for long-term food price forecasting

Solution 2: Assess the significance of regional and categorical features such as commodity type, geographic location, and seasonality in influencing food price predictions

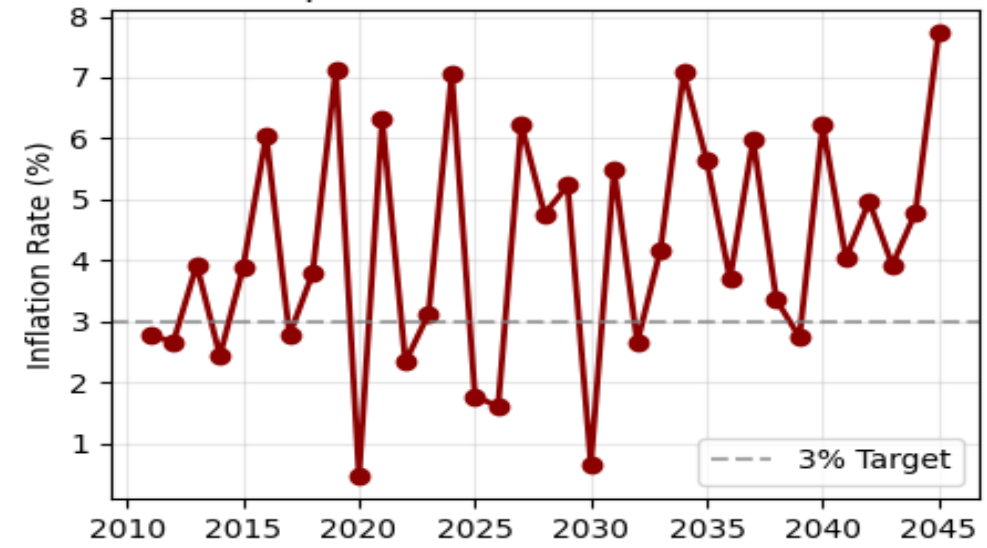
AVERAGE PRICE (PHP) PER REGION



- Region
- BANGSAMORO
 - AUTONOMOUS REGION IN MUSLIM MINDANAO
 - Bicol
 - Cagayan Valley
 - Calabarzon
 - Caraga
 - Central Luzon
 - Central Visayas
 - Cordillera Administrative region
 - Davao Region
 - Eastern Visayas
 - ILOCOS
 - Metro Manila
 - Mimaropa
 - Northern Mindanao
 - Soccsksargen
 - Western Visayas
 - Zamboanga Peninsula



Expected Annual Inflation Rate



Solution 3: Design and implement an ICT-based forecasting platform



YEAR	PRICE (P/KG)	TYPE
2010	P25.18	Historical
2015	P32.40	Historical
2020	P41.00	Historical
2023	P46.50	Historical
2025	P49.20	Forecast
2030	P55.80	Forecast
2035	P60.40	Forecast
2040	P66.90	Forecast
2045	P70.80	Forecast

Solution 4: Facilitate regional knowledge transfer and collaboration, sharing methodologies, datasets, and tools with ASEAN partners to enable adaptation in diverse contexts.

The framework will be shared with ASEAN partners to promote regional replication and strengthen ICT-based food security collaboration.

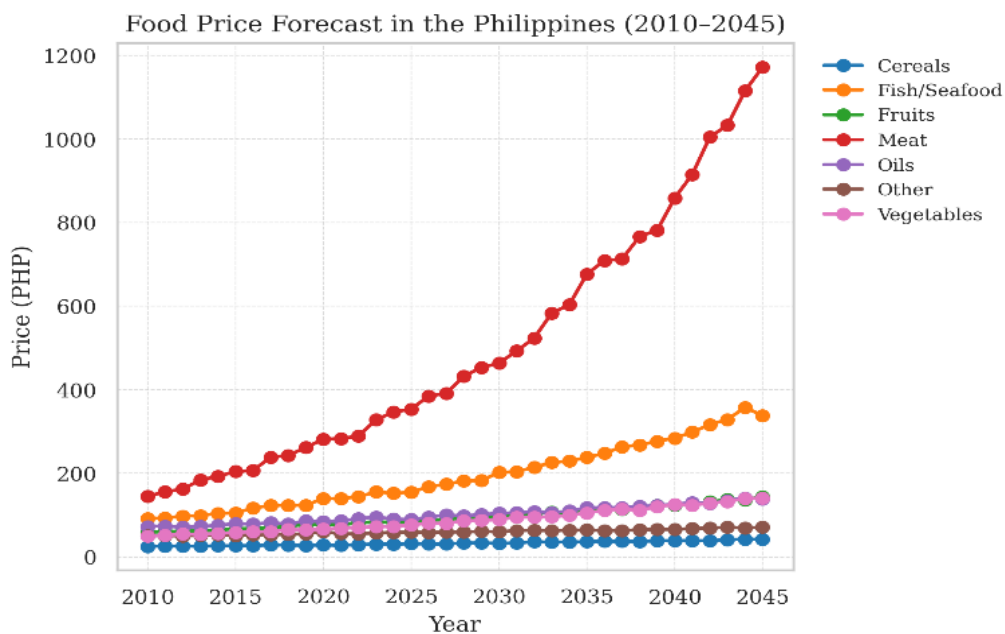
Impact:

- The system empowers Philippine policymakers and farmers with timely, AI-driven forecasts for more stable food prices.
- It strengthens national food security planning by identifying regional disparities and predicting future market conditions.
- Through its open, ICT-based framework, the project promotes transparency, resilience, and data-informed governance.
- Ultimately, it contributes to ASEAN food system stability and SDG 2: Zero Hunger through collaborative, technology-enabled forecasting.



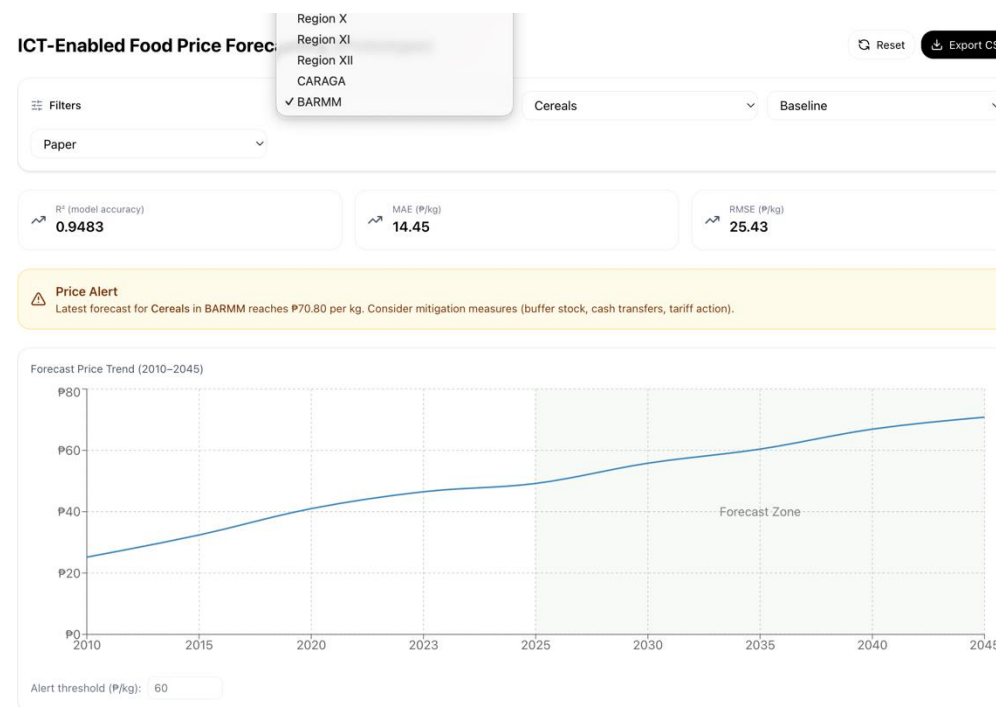
Scientific:

- The project produces a validated machine learning-based forecasting model capable of long-term food price prediction up to 2045.
- It introduces a novel ICT-integrated forecasting dashboard that demonstrates how AI and data science can be applied to food security analytics.
- This contributes to the growing field of applied AI in agricultural economics, providing a transferable model for similar use in other ASEAN nations.



Societal:

- The project generates an **open-access dataset** and **interactive forecasting tool** that can be used by policymakers, farmers, and researchers.
- It enables evidence-based decision-making, potentially reducing the impact of **price shocks** on low-income households and improving food affordability.
- The platform also encourages **data transparency and public participation** in food system monitoring.



Collaborative:

- The initiative establishes new partnerships among academic institutions, government agencies, and ASEAN ICT researchers.
- It opens opportunities for regional collaboration, joint research publications, and cross-border data sharing for food security.
- The model's open design invites future integration with regional partners in ASEAN and beyond.

Other Impact:

- The project contributes to UN SDG 2 (Zero Hunger) and SDG 9 (Industry, Innovation, and Infrastructure) through technological innovation in agriculture.
- It lays the groundwork for a regional early-warning system for food price instability under the ASEAN IVO framework.
- In the long term, it builds resilience, inclusivity, and innovation in Southeast Asia's digital food systems..





- The project will develop and evaluate a machine learning–based food price forecasting system to strengthen food security in the Philippines.
- It will also analyze regional and commodity-level drivers of price fluctuations and integrate findings into an ICT-enabled dashboard for real-time policy use.



- Using over 100,000 records from the WFP Philippines Food Prices dataset (2010–2023), models such as Linear Regression, Random Forest and Gradient Boosting will be trained to forecast prices up to 2045.
- An interactive web-based platform will be designed to visualize results, simulate policy scenarios, and issue early warnings for potential price shocks.



- Scientifically, the project will advance the application of AI in agricultural economics and introduce a reusable ICT framework for food price forecasting.
- Socially, it will empower farmers, traders, and policymakers through data-driven insights that enhance market stability and protect low-income consumers.



- The framework will be adaptable for ASEAN-wide collaboration, promoting regional cooperation in ICT and food security analytics.
- It will contribute to the UN SDG 2 (Zero Hunger) and strengthen ASEAN resilience against food price volatility.

END

**PHILIPPINES & ASEAN:
ICT-POWERED FOOD SECURITY**

- Smart Agriculture Initiatives
- Data-Driven Policies
- Early Warning Systems
- Enhanced Yields & Distribution
- Price Stability & Affordability
- Regional Collaboration



John A. Bacus
jabacus@mcm.edu.ph