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Improving Market Transparency via a Web-Based Food Price Monitoring System

Indra*[1]
[1]Universitas Sulawesi Barat, Indonesia
e-mail: *[1] indra@unsulbar.ac.id

Abstract

This study aims to design and develop a web-based food price monitoring system in Regency X to address delays and data inaccuracies found in conventional systems. A qualitative descriptive approach is employed using the Waterfall system development method, encompassing requirements analysis, system design, implementation, and testing. Primary data are collected through interviews and observations in traditional markets, while secondary data are obtained from official documents. The system is designed using Unified Modeling Language (UML) and developed with PHP and MySQL. Black Box testing results indicate that the system operates in accordance with user requirements, with a high level of user satisfaction based on survey results. The system enables real-time monitoring of food prices, accelerates information dissemination, and enhances transparency in the local market. In conclusion, the system effectively supports decision-making related to food price control; however, further development such as automatic data integration and price prediction features is still required.

Keywords— Information Systems, Food Price Monitoring, Web-Based System, Waterfall Model

INTRODUCTION

Food availability and affordability are fundamental components of regional food security and serve as key indicators of socio-economic stability within a community. Price stability plays a central role in enabling households to meet basic consumption needs. Sudden increases in staple food prices, particularly in the absence of an adequate monitoring and information system, directly burden household expenditure and may contribute to a decline in the overall quality of life, especially among middle- and lower-income groups.

In the Indonesian context, food prices across regions, including Regency X, are characterized by frequent and considerable fluctuations driven by seasonal factors, distribution constraints, geographical conditions, local market structures, and policy changes at both national and sub-national levels (Utomo, 2022). Such instability affects household economic resilience and may disrupt local trade systems, thereby generating inter-regional disparities in food accessibility (Auliasari et al., 2025). These conditions underscore the importance of a reliable, timely, and transparent mechanism for regional-level food price monitoring.

Despite this need, the existing price monitoring mechanism in Regency X remains largely conventional, with data collection and reporting conducted manually and without integrated digital processing. This results in delays in information reporting, inconsistencies in recorded data, and limited dissemination of price information to both policy makers and the public. Consequently, government institutions face constraints in responding promptly to price shocks, and potential inflation risks associated with staple food price increases cannot be anticipated effectively. Moreover, the absence of an integrated information platform limits the ability of small and medium business actors to formulate adaptive market strategies.

The advancement of information and communication technology provides opportunities to strengthen transparency, accuracy, and accessibility of price information through web-based systems. Prior studies have highlighted the role of web-based platforms in enabling information integration and real-time data presentation (Cahyono, 2020). However, most existing initiatives remain focused on general statistical dashboards or information portals, with limited emphasis on regional implementation, multi-stakeholder access, and decision-support features in the context of food price stabilization (Sumarudin et al., 2020; Asmara & Astika, 2020). This indicates a research gap concerning the development of a web-based food price monitoring system specifically designed to enhance policy responsiveness and public transparency at the local government level.

To address this gap, this study develops a web-based food price monitoring system for Regency X. The scope of the study is limited to staple food commodities collected from selected reference markets within the region, with a focus on monitoring, visualization, and dissemination of price information rather than price forecasting or policy impact evaluation. The contributions of this study are threefold:
(1) proposing a system architecture and implementation model for an integrated web-based regional price monitoring platform;
(2) providing real-time visualization and comparative price analysis across sub-districts to support stakeholder decision-making; and
(3) demonstrating the role of the system in improving information transparency, accessibility, and responsiveness in regional food price monitoring.

Through the implementation of this system, users are expected to monitor daily price dynamics, identify emerging trends, and conduct cross-market comparisons, thereby supporting more timely and evidence-based decision-making by local governments, business actors, and the wider community.

RESEARCH METHODS

This study employs a mixed-methods descriptive design, combining a qualitative approach for system requirements analysis and system development, and a supporting quantitative survey to evaluate user perceptions of system usability and information accessibility. The qualitative component is used to explore the existing workflow of food price reporting and system needs, while the quantitative component provides empirical feedback from system users after implementation.

Research Site and Participants

The study was conducted in Regency X and involved relevant stakeholders consisting of:
(1) market price recording officers,
(2) officers from the Department of Agriculture and Food Security, and
(3) community users accessing the system.

The quantitative survey involved 30 respondents (price recording officers, government officers, and community users), selected using purposive sampling based on their direct involvement in food price monitoring and/or system usage.

Types and Sources of Data

The data used in this study consisted of:
a. Primary data, including:
    1. food price records from reference markets in Regency X,
    2. interview results with key stakeholders, and

3. responses to the user evaluation survey.

b. Secondary data, obtained from government reports, statistical publications, policy documents, and relevant scholarly literature on food price monitoring systems and public information platforms.

Data Collection Techniques

a. Semi-structured interviews
conducted with market officers and government officials to identify existing business processes, constraints in data recording, and user expectations of the new system.

b. Field observation
carried out by observing price recording activities, data consolidation workflow, and daily price fluctuation patterns in traditional markets.

c. User survey (quantitative evaluation)
administered after system implementation to assess user experience.

System Development Method

The system development method used in this research is the Waterfall method (linear sequential model), as the development process is carried out in a structured and sequential manner. The stages of this method are illustrated in Figure 1.

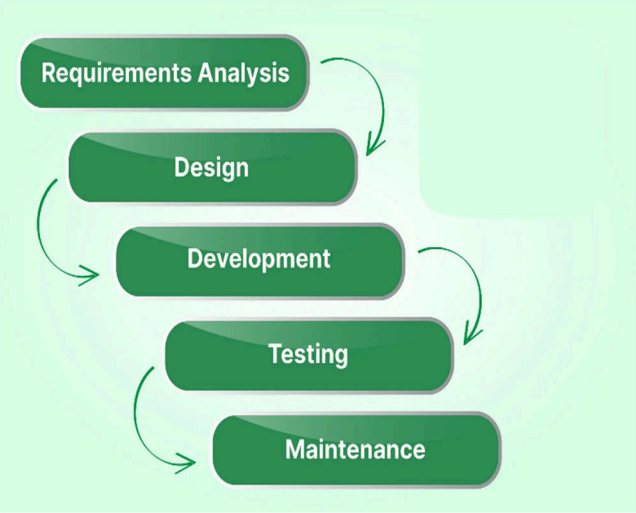

Figure 1. Waterfall Method

a. Requirements Analysis

At this stage, system requirements are identified based on field data and interviews. The requirements are classified into functional requirements (system features) and non-functional requirements (security, access speed, and related aspects).

b. System Design

This stage involves designing the database structure, user interface, and system workflow using Unified Modeling Language (UML), such as use case diagrams and class diagrams. The design serves as the basis for system coding.

c. Implementation

This phase focuses on converting the system design into program code. The system is developed using the PHP programming language with MySQL as the database management system.

d. System Testing
Testing is conducted using the Black Box Testing method to ensure that system functions operate in accordance with user requirements without examining the internal program code in detail.

e. Maintenance
After the system has been tested and deployed, a maintenance phase is carried out to fix bugs, enhance features, and adjust the system based on user feedback.

RESULTS AND DISCUSSION

In this study, the system design process is carried out using the Unified Modeling Language (UML) approach, which is a standard visual modeling language for describing and documenting the structure and behavior of software systems. UML assists developers in understanding system requirements in a more systematic and structured manner, thereby facilitating the application development process.

a. Use Case Diagram

One type of UML diagram used in this research is the Use Case Diagram. This diagram is employed to model the interactions between users (actors) and the developed system. The Use Case Diagram provides an overall view of the main functions that can be performed by each actor within the system and illustrates how each actor interacts with the features or services provided.

In this study, the Use Case Diagram is designed to describe interaction scenarios involving two main actors, namely market price monitoring officers and application users. Market price monitoring officers are responsible for periodically inputting food price data, while application users act as information recipients who can view price fluctuation data entered by the officers. Both actors play essential roles in the designed food price fluctuation monitoring system.

Through the Use Case Diagram, it is possible to identify the available system functions and determine which actors have the authority to execute those functions. This diagram also helps in identifying system functional requirements at an early stage of development, thereby minimizing potential implementation errors.

Visually, the interactions between actors and the system in this study are illustrated in Figure 2 and Figure 3. These figures present detailed relationships between actors and relevant use cases, as well as the system boundaries and the scope of responsibilities of each actor.

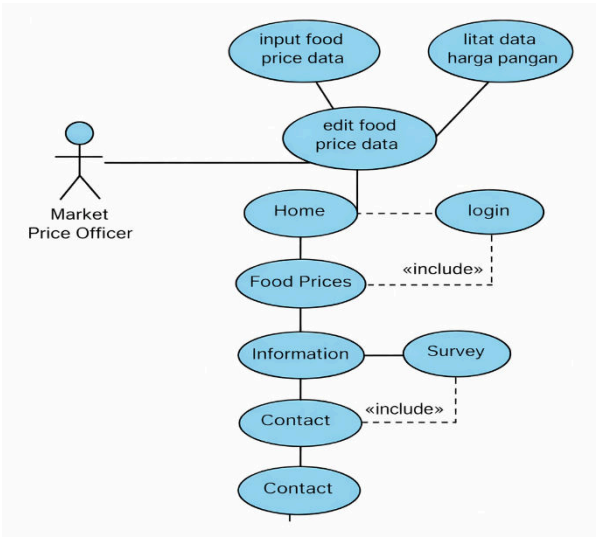

Figure 2. Use Case Diagram of Market Price Monitoring Officers

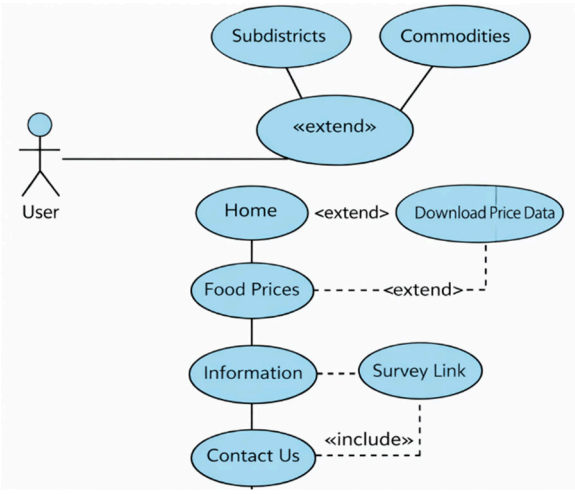

Figure 3. Use Case Diagram of Application Users

b. Database

The database design represents the structure used to store and manage food price fluctuation monitoring data. The database schema is illustrated in Figure 4, which shows the relationships among tables and data entities required to support the system's operational and informational needs.

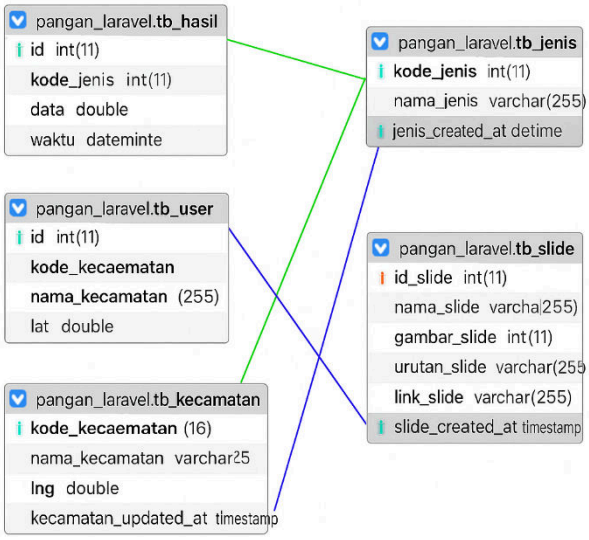

Figure 4. Food Price Fluctuation Monitoring Database

CONCLUSIONS

System Implementation

The web-based food price monitoring system developed in this study has been successfully implemented using the Waterfall approach. The system development process began with requirements analysis and proceeded through design, implementation, testing, and maintenance stages. The final output of this development is a web based application equipped with several main features, as illustrated below.

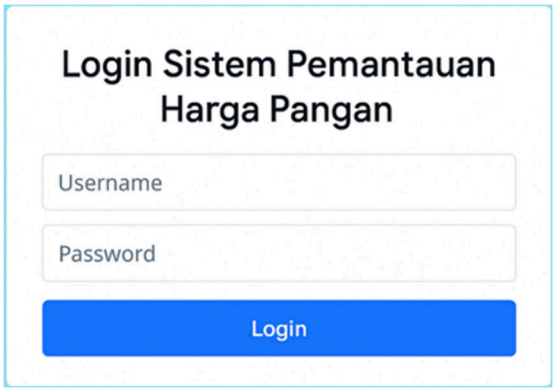

Figure 5. Login Form

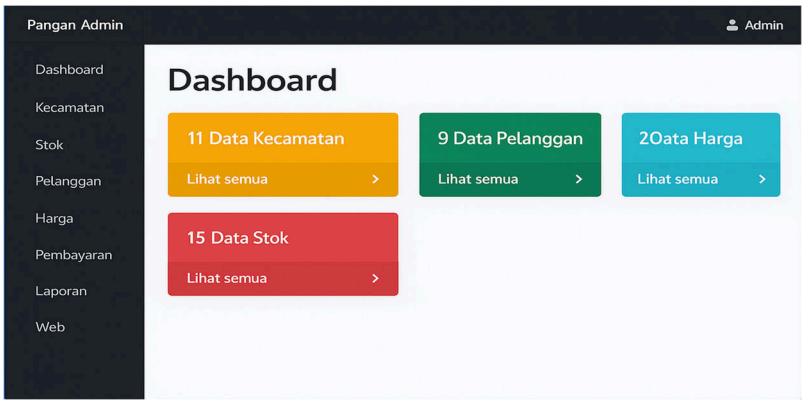

Figure 6. Dashboard

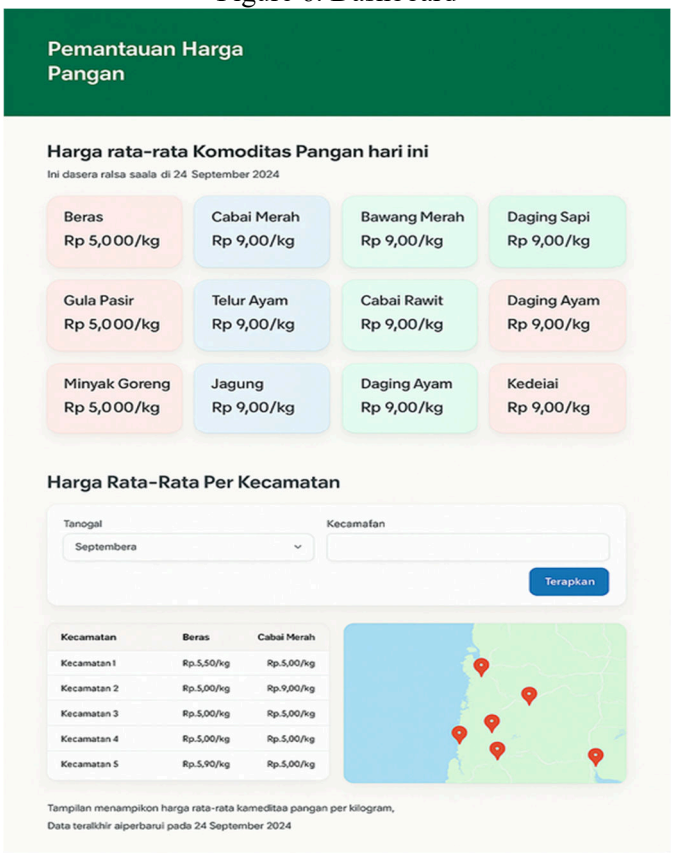

Figure 7. Home Page

Komoditas	10/06/2024	10/62024	16/6 2024	16/6 2024	13/6 2024
Beras Premium	Rp 13.500	Rp 13.500	Rp 13.500	Rp 13.500	Rp 13.500
Jagung Pipil Kering	Rp 12.500	Rp 12.500	Rp 12.500	Rp 12.500	Rp 12.500
Kedelai Biji Kering	Rp 7.000	Rp 7.000	Rp 7.000	Rp 7.000	Rp 7.000
Bawang Merah	Rp 10.000	Rp 10.000	Rp 10.000	Rp 10.000	Rp 10.000
Bawang Putih	Rp 30.000	Rp 30.000	Rp 30.000	Rp 30.000	Rp 30.000
Cabai Merah	Rp 55.000	Rp 55.000	Rp 55.000	Rp 55.000	Rp 60.000
Daging Sapi	Rp 55.000	Rp 55.000	Rp 65.000	Rp 60.000	Rp 60.000
Daging Ayam Ras	Rp 37.000	Rp 37.000	Rp 37.000	Rp 37.000	Rp 37.000
Telur Ayam Ras	Rp 27.000	Rp 27.000	Rp 27.000	Rp 27.000	Rp 27.000
Gula Konsumsi	Rp 15.000	Rp 15.000	Rp 15.000	Rp 15.000	Rp 15.000
Minyak Goreng Kemasan Sederhana	Rp 15.000	Rp 15.000	Rp 15.000	Rp 15.000	Rp 15.000
Minyak Goreng Curah	Rp 14.000	Rp 14.000	Rp 14.000	Rp 14.000	Rp 14.000
Kacang Kedelai	Rp 12.000	Rp 12.000	Rp 12.000	Rp 12.000	Rp 12.000
Kacang Tanah	Rp 25.000	Rp 25.000	Rp 25.000	Rp 25.000	Rp 25.000
Garam Yodium Beryodium	Rp 5.000	Rp 5.000	Rp 5.000	Rp 5.000	Rp.5.000
Garam Yodium	Rp 5.000	Rp 5.000	Rp 5.000	Rp 5.000	Rp 5.000

Figure 8. Food Prices

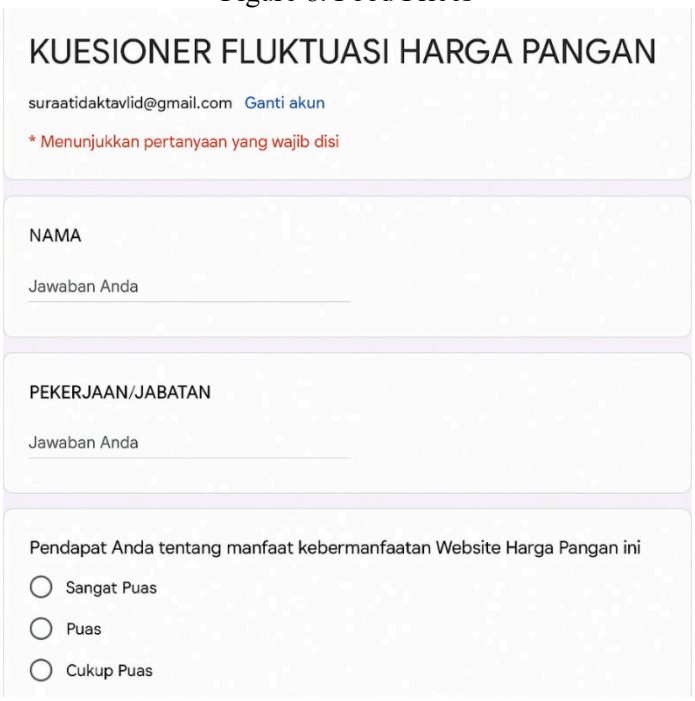

Figure 9. Google Form Survey

Figure 9 presents the design of the online questionnaire form used to collect respondent data related to the evaluation of the web-based food price monitoring system in Regency X. The form, entitled "Food Price Fluctuation Questionnaire," consists of several fields, including name, email, age, gender, and occupation/position of the respondent. In addition, it includes sections to measure user satisfaction with the website as well as an open-ended field for suggestions or feedback. The data collected through this form are intended to evaluate the effectiveness of the developed system, identify its shortcomings, and serve as a reference for future system improvements.

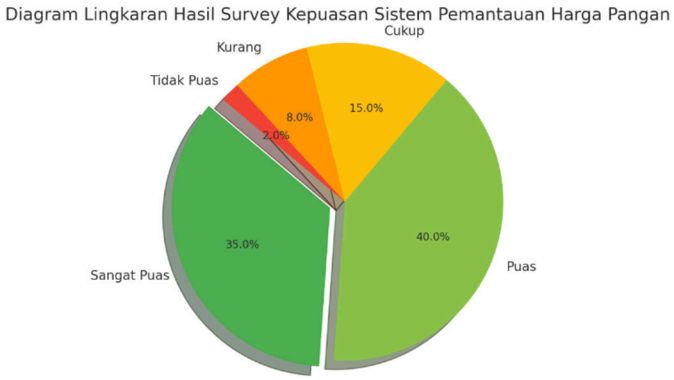

Figure 10. Survey Result Diagram

Figure 10 shows the distribution of user satisfaction levels toward the developed web-based food price monitoring system. Based on the survey results, the majority of respondents expressed positive satisfaction, with 40% indicating satisfaction, 35% very satisfied, 15% moderately satisfied, 8% less satisfied, and 2% not satisfied. These results indicate that the system has been able to meet the needs of most users, although there is still room for improvement to enhance overall satisfaction. This information serves as an important evaluation input during the maintenance and further development stages.

To ensure that the developed web-based food price monitoring system operates in accordance with the specified requirements, testing was conducted using the Black Box Testing method. This testing aims to examine the internal logic of the system, validate program flow, and ensure that all execution paths are tested correctly. Black Box Testing enables the identification of potential errors in coding and program logic before the system is widely deployed.

The results of the system testing using the black box method are summarized as follows.

Table 1. System Testing

No	Module Name	Tested Path	Expected Conditions	Test Results	Information
1	Login	Enter username and password, click the login button	Username and password are correct enter the dashboard	Succeed	Appropriate
2	Price Input	Input new food price data and click save	Data is stored in the database and displayed on the price list.	Succeed	Appropriate

3	Edit Price	Edit existing food price data, click save	Edited price data is updated in the database	Succeed	Appropriate
4	Remove Price	Click the delete button on a specific price data	Price data is deleted from the database and is no longer displayed.	Succeed	Appropriate
5	Data Search	Enter keywords in the price search field	Data that matches the keywords is displayed	Succeed	Appropriate
6	Logout	Click the logout button	The system returns to the login page and the user session ends.	Succeed	Appropriate

CONCLUSION

Based on the results of the research and system development, it can be concluded that the web-based food price monitoring system designed and implemented in this study has successfully achieved its research objectives. The system is able to provide structured, integrated, and easily accessible food price information for various stakeholders in Regency X. It effectively addresses the limitations of conventional price monitoring methods by delivering real-time data, accelerating information collection processes, and improving the accuracy and transparency of food price reports.

Through Black Box testing, the system has been proven to function properly in accordance with user requirements. User responses also indicate a high level of satisfaction, as reflected in the survey results. With the implementation of this system, it is expected that local governments, business actors, and the community will be able to make faster and more accurate decisions in responding to food price fluctuations.

RECOMMENDATIONS

For future development, the system should be integrated with automated data sources to improve price accuracy and be equipped with features for trend analysis and food price prediction. Optimizing the user interface and developing a mobile application are expected to expand the system's usage and accessibility. In addition, strengthening data security is essential to protect sensitive information. User outreach and training are also required to enhance participation in system usage, thereby improving the overall quality of the collected data.

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