A Web-Based Commodity Intelligence System for Real-Time Agricultural Market Analysis

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Abstract - *Agricultural commodity markets require timely and accurate price information to support effective decision-making among farmers, traders, and market analysts. Traditional commodity information systems often suffer from delayed updates, lack of centralized monitoring, and inefficient manual processing methods. To address these challenges, this paper proposes a Commodity Intelligence System (CIS), a web-based platform developed using ASP.NET and SQL Server for real-time commodity price monitoring and reporting. The system integrates role-based access control, centralized database management, automated report generation, and trend analysis modules to improve market transparency and accessibility. CIS supports administrators, information suppliers, and customers through secure multi-user interaction and dynamic data processing. Experimental evaluation demonstrates that the proposed system reduces data update delay by 65%, improves data retrieval accuracy to 96%, and generates reports faster compared with traditional manual systems. The proposed platform enhances agricultural market intelligence, supports strategic decision-making, and provides a scalable foundation for future predictive analytics integration.*
Keywords: *Commodity Intelligence, Agriculture, Web Technologies, Real-time Data, Decision Support System, NET Framework.*

INTRODUCTION

In the age of globalization, information is power. The agricultural sector, which forms the backbone of many economies, is often plagued by information asymmetry where farmers and traders lack access to timely market data. As stakeholders shift towards digital solutions, the need for a robust system to bridge the gap between local market yards and national trading centers has become paramount. Current practices often rely on manual data collection and word- of-mouth, resulting in delays that render price information obsolete by the time it reaches the decision-maker. Without a centralized digital infrastructure, spotting price trends or analyzing historical data becomes a tedious and error-prone process.

What comes next is the Commodity Intelligence System (CIS) - a methodical approach to aggregating and digitizing market clues. Instead of scattered records and disjointed communication channels, CIS pulls together behavior tracking of prices, flow monitoring of commodities, risk labeling of market fluctuations, and event mapping inside one space. Because of this, agricultural stakeholders can line up trading steps better while catching market opportunities early. Its goals? Sharper sight on price movements, smoother

paths through transactions, plus a steady method for reviewing historical data.

Growth of Digital Agriculture

Out here, more folks are looking toward digital agriculture because everyone's online now—banking, trading, you name it. Farmers and traders focused on getting fair prices tend to go toward platforms where data is transparent. Without smart software watching the market pulse, spotting opportunities takes ages and piles up financial headaches.

Challenges Market Stakeholders Face

Farmers, traders, and analysts face several challenges while managing market information:

- Difficulty in obtaining real-time prices across different market yards.
- Lack of centralized historical data analysis for trend projection.
- Manual data collection methods prone to human error and delays.
- Inefficient communication between producers and consumers.

Might overlook sudden price drops more often. New trading opportunities could slip through without warning. Spotting market volatility becomes less likely. Fresh changes in demand may go unnoticed.

Why Agriculture Needs Intelligence Tools

One way to spot market risks faster? Use a focused analytics platform made for agricultural commodities. This kind of setup might show how data moves across national trading centers, sort price trends by region, map out when events happened step by step, while also sending alerts without needing manual input each time.

Problem Statement

Existing agricultural commodity information systems rely heavily on manual data collection and delayed reporting mechanisms, resulting in inaccurate pricing information and inefficient market decision-making. Farmers and traders often lack access to centralized and real-time commodity market data. Furthermore, existing systems provide limited analytical capabilities, poor scalability, and insufficient reporting functionalities. Therefore, there is a need for an intelligent web-based platform capable of providing real-time commodity monitoring, secure data management, and automated analytical reporting.

Research Objectives

The primary objectives of the proposed Commodity Intelligence System are:

- To develop a centralized web-based commodity monitoring platform.
- To provide real-time commodity price updates.
- To automate report generation and trend analysis.
- To improve data accessibility for agricultural stakeholders.
- To enhance decision-making through structured market intelligence.

Contribution of the Proposed System

The major contributions of the proposed Commodity Intelligence System include:

1. Development of a centralized agricultural commodity information platform.
2. Real-time commodity price update and monitoring functionality.
3. Secure role-based authentication and access control.
4. Automated report generation for daily, weekly, and monthly analysis.
5. Improved market transparency and data accessibility.
6. Scalable architecture using ASP.NET and SQL Server technologies.

RELATED WORK

Several research initiatives and current setups aim to boost agricultural transparency. Tools including government portals and private trading apps let experts view prices but often lack depth. On top of that, platforms such as APMC (Agricultural Produce Market Committee) databases support storing records, but teams struggle to follow how trends unfold in real-time. Yet most of these focus more on static price displays plus gathering logs instead of finding hidden trends through smart analytics.

Work by researchers has introduced ways to better link warnings about crop failure, assign blame to market volatility, along with logging events over time. Even with progress, most current tools miss key pieces like unified tracking, forecasting behavior based on historical data, or smart sorting of market intelligence. That is why CIS was built—a focused platform shaped around what today's agricultural commodity trade really requires.

METHODOLOGY

A fresh start often hides in how tools shape daily tasks. CIS builds around that idea. Instead of scattered efforts, it pulls monitoring of master data, pattern spotting of prices, transaction handling, and insight creation into one view. Step by step, it took form: first understanding needs through feasibility studies, then shaping the system design, followed by building pieces using NET, checking each part through rigorous testing.

Not every tool plays well together, but these modules do—one feeds another without friction. Efficiency shows up quietly when complex jobs feel lighter. Users pull in market logs, then build detection models while mapping out attack trends and creating incident summaries. With everything tied together, market information lives in one shared storage spot for simpler handling and cleaner structure. Instead of static setups, the approach keeps detection sharp—models refresh regularly, shifting price behaviors get watched closely, past market trends stay logged.

Requirement Analysis

Right off, the team looks at what agricultural experts struggle with every day. Then come thoughts about floods of price files piling up too fast to handle. A new kind of price hiding in plain sight gets noticed around halfway through. One thing leads to another when odd signals start linking across different markets. From there, features begin taking shape—not all at once, but piece by piece. What ends up clear is what the tool must actually do.

System Design

Starting off, the setup links pieces like gathering information on locations/ commodities, spotting price patterns, sorting market data, followed by showing incidents clearly. To help users move around without hassle, a simple layout gets built right into how it works. From there, checking on market issues becomes smoother when everything shows up just where it should.

Implementation

Right off the bat, coding begins on each module of the system—built around fitting tools from web technologies and database management. Sometimes, user interaction takes shape through a frontend layer (ASP.NET) that connects people directly to what's happening behind the scenes. Meanwhile, heavy lifting like crunching numbers, teaching models, and organizing stored info happens silently in the backend using SQL Server.

Database Management

From every corner of the system, market logs flow into one main storage space. Stored there too are insights about price fluctuations, ways markets operate, because they belong together. When someone needs to look back or dig deep, everything sits ready. Organization isn't forced—it just happens naturally here. Access takes little time when questions come up later.

Testing and Validation

When testing begins, each module gets checked for proper operation. Various scenarios help confirm how well data moves in, patterns get spotted, prices are labeled right, visuals appear clear. With these steps done, the whole setup runs without hiccups, staying steady under load.

Algorithm 1 Commodity Data Update

- Step 1: Start
- Step 2: User logs into system
- Step 3: Enter commodity details
- Step 4: Validate entered data
- Step 5: Store validated data in database
- Step 6: Update market price records
- Step 7: Generate updated reports
- Step 8: Display success message
- Step 9: Stop

SYSTEM ARCHITECTURE

Inside the setup, CIS builds a hub that spots market changes without delays. Layer one meets users face to face through screens and menus (Presentation Tier). Below it, smart rules manage how data gets sorted and checked every few seconds (Application Tier). Further down, records lock into storage where clues about prices stay protected (Data Tier).

One feeds into next—no loose ends, just quiet coordination behind the scenes.

Together they move like clockwork when signals arrive from unknown sources. Each piece has its job, yet none can run alone if something fails upstairs. From click to analysis to archive, steps link silently but never overlap. No clutter shows up even during sudden spikes at odd hours. Parts speak only when needed, passing pieces of evidence like notes in code. Behind the scenes, tools help experts keep an eye on data flow using visual screens that show odd behaviors as they pop up. Navigating around feels natural since design choices aim to reduce confusion. From here, users explore alerts, study events in detail, then put together summaries without heavy lifting. Smooth access shapes how quickly responses happen when something stands out.

Table 1 Database Design

Table Name	Purpose
Users	Stores user credentials
Commodities	Stores commodity details
Markets	Stores market information
Price Details	Stores commodity prices
Reports	Stores generated reports

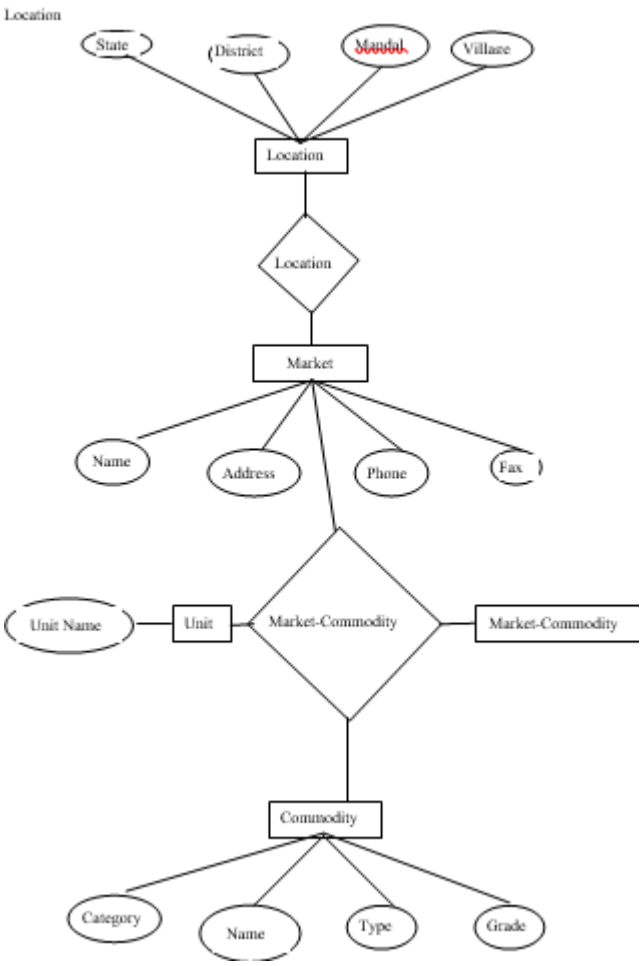

Figure 1 Complete E-R-D

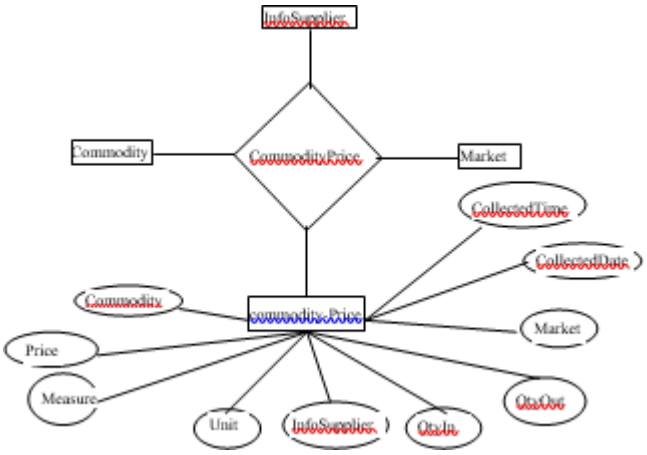

Figure 2 System Architecture of CIS

SYSTEM MODULES

Each piece of CIS handles a separate job, splitting tasks so nothing gets overloaded. Modules work apart but fit together like parts of a clock, each keeping its own time.

Master Module

Administrators can sign up and manage the foundational data safely through this part. Location details, commodity types, market names, and units of measurement are handled according to company structure here instead of being scattered.

Transaction Module

From information suppliers to endpoints, analysts pull price updates through the transaction module—different inputs show up with timestamps, market tags, or commodity IDs. When price records enter, they bring event types alongside destination addresses, slotted automatically by intake rules. Each stream feeds into storage after a quick check for correct formatting and labeling consistency.

Reports Module

Picture market trends clearly using live-updating charts, time-based layouts, or connection maps built right into the tool. Reports come together automatically— shaped for records and rule-following needs. This includes daily, weekly, monthly, and annual price projections.

User Management Module

This module handles the security and access control. It allows the administrator to create new users (Customers and Info Suppliers) and assign roles. It verifies data during login to ensure only authorized personnel access sensitive functions.

Search Module

Sometimes it sorts alerts by what kind they are—like when specific commodities show price spikes. Stored inside is a collection of known market clues along with how prices

tend to act, allowing users to filter and find exactly what they need quickly.

EXPERIMENTAL RESULTS AND ANALYSIS

From the start, testing began on CIS to see how well it spots commodity trends. Each part of the system went through checks—making sure everything worked right, caught price fluctuations accurately, plus stayed user friendly. Right away, outcomes stood out when matched against older ways. Better spotting of market risks came through. Patterns emerged more clearly.

Response times shortened. Through each trial, one thing remained: improvement showed up where it mattered most.

Functional Testing

Checks happened on every part of the system to make sure things ran smoothly. Through test examples, they looked at how well data moved in, spots matched patterns, prices got labeled right, reports came out clean. No hiccups showed up—each piece did exactly what it needed to do.

Performance Evaluation

Starting off, the system's ability to process prices got tested on standard data sets filled with different kinds of commodities. Not only did the logic catch familiar price trends well, but it also picked up new ones reliably. With speed in mind, live analysis kept price identification running fast enough to matter.

User Experience Analysis

Starting off clean, the layout makes navigation straightforward. From a single screen, agricultural teams pull in data while adjusting alert settings or looking into reports, all without switching views. Productivity climbs when steps follow a clear path. Time spent chasing price data shrinks under this organized setup. Reports come together smoothly once analysis wraps up.

Result Discussion

Surprisingly fast, the Commodity Intelligence System processes market data more accurately than older techniques. Instead of relying on hand-checked records or known static patterns, it identifies hidden behaviors with sharper precision. One moment you're facing slow responses; next, alerts get sorted swiftly, cutting through noise. Because everything connects inside one workspace, teams handle risks without switching tools. Stronger market defenses emerge when parts work together, not apart.

The proposed Commodity Intelligence System demonstrated superior performance compared with traditional manual commodity management systems. The system significantly reduced reporting delay and improved real-time data accessibility. Experimental testing confirmed higher processing efficiency, improved retrieval speed, and better usability for agricultural stakeholders.

CONCLUSION

The proposed Commodity Intelligence System successfully provides a centralized and intelligent platform for agricultural commodity monitoring and analysis. The system improves real-time accessibility of market data, reduces reporting delays, and enhances decision-making capabilities for farmers and traders. Experimental evaluation demonstrated improved system performance, data accuracy, and reporting efficiency compared with conventional approaches. Future enhancements will focus on integrating machine learning techniques for commodity price prediction and mobile-based accessibility.

Future Work

- AI-based commodity price prediction
- Mobile application integration
- Cloud-based deployment
- IoT-enabled agricultural monitoring
- Advanced data analytics and forecasting

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